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(54) Title: NOVEL NUCLEIC ACIDS AND POLYPEPTIDES

(57) Abstract: The present invention provides novel nucleic acids, novel polypeptide sequences encoded by these nucleic acids and uses thereof.

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NOVEL NUCLEIC ACIDS AND POLYPEPTIDES

1. TECHNICAL FIELD

The present invention provides novel polynucleotides and proteins encoded by such polynucleotides, along with uses for these polynucleotides and proteins, for example in therapeutic, diagnostic and research methods.

2. BACKGROUND

Technology aimed at the discovery of protein factors (including *e.g.*, cytokines, such as lymphokines, interferons, circulating soluble factors, chemokines, and interleukins) has matured rapidly over the past decade. The now routine hybridization cloning and expression cloning techniques clone novel polynucleotides "directly" in the sense that they rely on information directly related to the discovered protein (*i.e.*, partial DNA/amino acid sequence of the protein in the case of hybridization cloning; activity of the protein in the case of expression cloning). More recent "indirect" cloning techniques such as signal sequence cloning, which isolates DNA sequences based on the presence of a now well-recognized secretory leader sequence motif, as well as various PCR-based or low stringency hybridization-based cloning techniques, have advanced the state of the art by making available large numbers of DNA/amino acid sequences for proteins that are known to have biological activity, for example, by virtue of their secreted nature in the case of leader sequence cloning, by virtue of their cell or tissue source in the case of PCR-based techniques, or by virtue of structural similarity to other genes of known biological activity.

Identified polynucleotide and polypeptide sequences have numerous applications in, for example, diagnostics, forensics, gene mapping; identification of mutations responsible for genetic disorders or other traits, to assess biodiversity, and to produce many other types of data and products dependent on DNA and amino acid sequences.

3. SUMMARY OF THE INVENTION

The compositions of the present invention include novel isolated polypeptides, novel isolated polynucleotides encoding such polypeptides, including recombinant DNA molecules, cloned genes or degenerate variants thereof, especially naturally occurring variants such as allelic variants, antisense polynucleotide molecules, and antibodies that specifically recognize one or more epitopes present on such polypeptides, as well as hybridomas producing such antibodies.

The compositions of the present invention additionally include vectors, including expression vectors, containing the polynucleotides of the invention, cells genetically engineered to contain such polynucleotides and cells genetically engineered to express such polynucleotides.

The present invention relates to a collection or library of at least one novel nucleic acid sequence assembled from expressed sequence tags (ESTs) isolated mainly by sequencing by hybridization (SBH), and in some cases, sequences obtained from one or more public databases. The invention relates also to the proteins encoded by such polynucleotides, along with therapeutic, diagnostic and research utilities for these polynucleotides and proteins. These nucleic acid sequences are designated as SEQ ID NO: 1-8051. The polypeptides sequences are designated SEQ ID NO: 8052-16102. The nucleic acids and polypeptides are provided in the Sequence Listing. In the nucleic acids provided in the Sequence Listing, A is adenosine; C is cytosine; G is guanine; T is thymine; and N is any of the four bases. In the amino acids provided in the Sequence Listing, * corresponds to the stop codon.

The nucleic acid sequences of the present invention also include, nucleic acid sequences that hybridize to the complement of SEQ ID NO: 1-8051 under stringent hybridization conditions; nucleic acid sequences which are allelic variants or species homologues of any of the nucleic acid sequences recited above, or nucleic acid sequences that encode a peptide comprising a specific domain or truncation of the peptides encoded by SEQ ID NO: 1-8051. A polynucleotide comprising a nucleotide sequence having at least 90% identity to an identifying sequence of SEQ ID NO: 1-8051 or a degenerate variant or fragment thereof. The identifying sequence can be 100 base pairs in length.

The nucleic acid sequences of the present invention also include the sequence information from the nucleic acid sequences of SEQ ID NO: 1-8051. The sequence information can be a segment of any one of SEQ ID NO: 1-8051 that uniquely identifies or represents the sequence information of SEQ ID NO: 1-8051.

A collection as used in this application can be a collection of only one polynucleotide. The collection of sequence information or identifying information of each sequence can be provided on a nucleic acid array. In one embodiment, segments of sequence information is provided on a nucleic acid array to detect the polynucleotide that contains the segment. The array can be designed to detect full-match or mismatch to the polynucleotide that contains the segment. The collection can also be provided in a computer-readable format.

This invention also includes the reverse or direct complement of any of the nucleic acid sequences recited above; cloning or expression vectors containing the nucleic acid sequences; and host cells or organisms transformed with these expression vectors. Nucleic acid sequences (or their reverse or direct complements) according to the invention have numerous applications in a variety

of techniques known to those skilled in the art of molecular biology, such as use as hybridization probes, use as primers for PCR, use in an array, use in computer-readable media, use in sequencing full-length genes, use for chromosome and gene mapping, use in the recombinant production of protein, and use in the generation of anti-sense DNA or RNA, their chemical analogs and the like.

In a preferred embodiment, the nucleic acid sequences of SEQ ID NO: 1-8051 or novel segments or parts of the nucleic acids of the invention are used as primers in expression assays that are well known in the art. In a particularly preferred embodiment, the nucleic acid sequences of SEQ ID NO: 1-8051 or novel segments or parts of the nucleic acids provided herein are used in diagnostics for identifying expressed genes or, as well known in the art and exemplified by Vollrath et al., Science 258:52-59 (1992), as expressed sequence tags for physical mapping of the human genome.

The isolated polynucleotides of the invention include, but are not limited to, a polynucleotide comprising any one of the nucleotide sequences set forth in SEQ ID NO: 1-8051; a polynucleotide comprising any of the full length protein coding sequences of SEQ ID NO: 1-8051; and a polynucleotide comprising any of the nucleotide sequences of the mature protein coding sequences of SEQ ID NO: 1-8051. The polynucleotides of the present invention also include, but are not limited to, a polynucleotide that hybridizes under stringent hybridization conditions to (a) the complement of any one of the nucleotide sequences set forth in SEQ ID NO: 1-8051; (b) a nucleotide sequence encoding any one of the amino acid sequences set forth in the Sequence Listing (*e.g.*, SEQ ID NO: 8052-16102); (c) a polynucleotide which is an allelic variant of any polynucleotides recited above; (d) a polynucleotide which encodes a species homolog (*e.g.* orthologs) of any of the proteins recited above; or (e) a polynucleotide that encodes a polypeptide comprising a specific domain or truncation of any of the polypeptides comprising an amino acid sequence set forth in the Sequence Listing.

The isolated polypeptides of the invention include, but are not limited to, a polypeptide comprising any of the amino acid sequences set forth in the Sequence Listing; or the corresponding full length or mature protein. Polypeptides of the invention also include polypeptides with biological activity that are encoded by (a) any of the polynucleotides having a nucleotide sequence set forth in SEQ ID NO: 1-8051; or (b) polynucleotides that hybridize to the complement of the polynucleotides of (a) under stringent hybridization conditions. Biologically or immunologically active variants of any of the polypeptide sequences in the Sequence Listing, and "substantial equivalents" thereof (*e.g.*, with at least about 65%, 70%, 75%, 80%, 85%, 90%, 95%, 98% or 99% amino acid sequence identity) that preferably retain biological activity are also contemplated. The polypeptides of the invention may be wholly or partially chemically synthesized but are preferably

produced by recombinant means using the genetically engineered cells (*e.g.* host cells) of the invention.

The invention also provides compositions comprising a polypeptide of the invention. Polypeptide compositions of the invention may further comprise an acceptable carrier, such as a hydrophilic, *e.g.*, pharmaceutically acceptable, carrier.

The invention also provides host cells transformed or transfected with a polynucleotide of the invention.

The invention also relates to methods for producing a polypeptide of the invention comprising growing a culture of the host cells of the invention in a suitable culture medium under conditions permitting expression of the desired polypeptide, and purifying the polypeptide from the culture or from the host cells. Preferred embodiments include those in which the protein produced by such process is a mature form of the protein.

Polynucleotides according to the invention have numerous applications in a variety of techniques known to those skilled in the art of molecular biology. These techniques include use as hybridization probes, use as oligomers, or primers, for PCR, use for chromosome and gene mapping, use in the recombinant production of protein, and use in generation of anti-sense DNA or RNA, their chemical analogs and the like. For example, when the expression of an mRNA is largely restricted to a particular cell or tissue type, polynucleotides of the invention can be used as hybridization probes to detect the presence of the particular cell or tissue mRNA in a sample using, *e.g., in situ* hybridization.

In other exemplary embodiments, the polynucleotides are used in diagnostics as expressed sequence tags for identifying expressed genes or, as well known in the art and exemplified by Vollrath et al., Science 258:52-59 (1992), as expressed sequence tags for physical mapping of the human genome.

The polypeptides according to the invention ean be used in a variety of conventional procedures and methods that are currently applied to other proteins. For example, a polypeptide of the invention can be used to generate an antibody that specifically binds the polypeptide. Such antibodies, particularly monoclonal antibodies, are useful for detecting or quantitating the polypeptide in tissue. The polypeptides of the invention can also be used as molecular weight markers, and as a food supplement.

Methods are also provided for preventing, treating, or ameliorating a medical condition which comprises the step of administering to a mammalian subject a therapeutically effective amount of a composition comprising a polypeptide of the present invention and a pharmaceutically acceptable carrier.

In particular, the polypeptides and polynucleotides of the invention can be utilized, for example, in methods for the prevention and/or treatment of disorders involving aberrant protein expression or biological activity.

The present invention further relates to methods for detecting the presence of the polynucleotides or polypeptides of the invention in a sample. Such methods can, for example, be utilized as part of prognostic and diagnostic evaluation of disorders as recited herein and for the identification of subjects exhibiting a predisposition to such conditions. The invention provides a method for detecting the polynucleotides of the invention in a sample, comprising contacting the sample with a compound that binds to and forms a complex with the polynucleotide of interest for a period sufficient to form the complex and under conditions sufficient to form a complex and detecting the complex such that if a complex is detected, the polynucleotide of interest is detected. The invention also provides a method for detecting the polypeptides of the invention in a sample comprising contacting the sample with a compound that binds to and forms a complex with the polypeptide under conditions and for a period sufficient to form the complex and detecting the formation of the complex such that if a complex is formed, the polypeptide is detected.

The invention also provides kits comprising polynucleotide probes and/or monoclonal antibodies, and optionally quantitative standards, for carrying out methods of the invention. Furthermore, the invention provides methods for evaluating the efficacy of drugs, and monitoring the progress of patients, involved in clinical trials for the treatment of disorders as recited above.

The invention also provides methods for the identification of compounds that modulate (*i.e.*, increase or decrease) the expression or activity of the polynucleotides and/or polypeptides of the invention. Such methods can be utilized, for example, for the identification of compounds that can ameliorate symptoms of disorders as recited herein. Such methods can include, but are not limited to, assays for identifying compounds and other substances that interact with (*e.g.*, bind to) the polypeptides of the invention. The invention provides a method for identifying a compound that binds to the polypeptides of the invention comprising contacting the compound with a polypeptide of the invention in a cell for a time sufficient to form a polypeptide/compound complex, wherein the complex drives expression of a reporter gene sequence in the cell; and detecting the complex by detecting the reporter gene sequence expression such that if expression of the reporter gene is detected the compound that binds to a polypeptide of the invention is identified.

The methods of the invention also provides methods for treatment which involve the administration of the polynucleotides or polypeptides of the invention to individuals exhibiting

symptoms or tendencies. In addition, the invention encompasses methods for treating diseases or disorders as recited herein comprising administering compounds and other substances that modulate the overall activity of the target gene products. Compounds and other substances can effect such modulation either on the level of target gene/protein expression or target protein activity.

The polypeptides of the present invention and the polynucleotides encoding them are also useful for the same functions known to one of skill in the art as the polypeptides and polynucleotides to which they have homology (set forth in the sequence listing). If no homology is set forth for a sequence, then the polypeptides and polynucleotides of the present invention are useful for a variety of applications, as described herein, including use in arrays for detection.

4. DETAILED DESCRIPTION OF THE INVENTION

4.1 DEFINITIONS

It must be noted that as used herein and in the appended claims, the singular forms "a", "an" and "the" include plural references unless the context clearly dictates otherwise.

The term "active" refers to those forms of the polypeptide which retain the biologic and/or immunologic activities of any naturally occurring polypeptide. According to the invention, the terms "biologically active" or "biological activity" refer to a protein or peptide having structural, regulatory or biochemical functions of a naturally occurring molecule. Likewise "immunologically active" or "immunological activity" refers to the capability of the natural, recombinant or synthetic polypeptide to induce a specific immune response in appropriate animals or cells and to bind with specific antibodies.

The term "activated cells" as used in this application are those cells which are engaged in extracellular or intracellular membrane trafficking, including the export of secretory or enzymatic molecules as part of a normal or disease process.

The terms "complementary" or "complementarity" refer to the natural binding of polynucleotides by base pairing. For example, the sequence 5'-AGT-3' binds to the complementary sequence 3'-TCA-5'. Complementarity between two single-stranded molecules may be "partial" such that only some of the nucleic acids bind or it may be "complete" such that total complementarity exists between the single stranded molecules. The degree of complementarity between the nucleic acid strands has significant effects on the efficiency and strength of the hybridization between the nucleic acid strands.

The term “embryonic stem cells (ES)” refers to a cell that can give rise to many differentiated cell types in an embryo or an adult, including the germ cells. The term “germ line stem cells (GSCs)” refers to stem cells derived from primordial stem cells that provide a steady and continuous source of germ cells for the production of gametes. The term “primordial germ cells (PGCs)” refers to a small population of cells set aside from other cell lineages particularly from the yolk sac, mesenteries, or gonadal ridges during embryogenesis that have the potential to differentiate into germ cells and other cells. PGCs are the source from which GSCs and ES cells are derived The PGCs, the GSCs and the ES cells are capable of self-renewal. Thus these cells not only populate the germ line and give rise to a plurality of terminally differentiated cells that comprise the adult specialized organs, but are able to regenerate themselves.

The term "expression modulating fragment," EMF, means a series of nucleotides which modulates the expression of an operably linked ORF or another EMF.

As used herein, a sequence is said to "modulate the expression of an operably linked sequence" when the expression of the sequence is altered by the presence of the EMF. EMFs include, but are not limited to, promoters, and promoter modulating sequences (inducible elements). One class of EMFs are nucleic acid fragments which induce the expression of an operably linked ORF in response to a specific regulatory factor or physiological event.

The terms "nucleotide sequence" or “nucleic acid” or “polynucleotide” or “oligonucleotide” are used interchangeably and refer to a heteropolymer of nucleotides or the sequence of these nucleotides. These phrases also refer to DNA or RNA of genomic or synthetic origin which may be single-stranded or double-stranded and may represent the sense or the antisense strand, to peptide nucleic acid (PNA) or to any DNA-like or RNA-like material. In the sequences herein A is adenine, C is cytosine, T is thymine, G is guanine and N is A, C, G or T (U). It is contemplated that where the polynucleotide is RNA, the T (thymine) in the sequences provided herein is substituted with U (uracil). Generally, nucleic acid segments provided by this invention may.be assembled from fragments of the genome and short oligonucleotide linkers, or from a series of oligonucleotides, or from individual nucleotides, to provide a synthetic nucleic acid which is capable of being expressed in a recombinant transcriptional unit comprising regulatory elements derived from a microbial or viral operon, or a eukaryotic gene.

The terms "oligonucleotide fragment" or a "polynucleotide fragment", "portion," or "segment" or “probe” or “primer” are used interchangeably and refer to a sequence of nucleotide residues which are at least about 5 nucleotides, more preferably at least about 7 nucleotides, more preferably at least about 9 nucleotides, more preferably at least about 11 nucleotides and most preferably at least about 17 nucleotides. The fragment is preferably less than about 500 nueleotides, preferably less than about 200 nucleotides, more preferably less than about 100

nucleotides, more preferably less than about 50 nucleotides and most preferably less than 30 nucleotides. Preferably the probe is from about 6 nucleotides to about 200 nucleotides, preferably from about 15 to about 50 nucleotides, more preferably from about 17 to 30 nucleotides and most preferably from about 20 to 25 nucleotides. Preferably the fragments can be used in polymerase chain reaction (PCR), various hybridization procedures or microarray procedures to identify or amplify identical or related parts of mRNA or DNA molecules. A fragment or segment may uniquely identify each polynucleotide sequence of the present invention. Preferably the fragment comprises a sequence substantially similar to any one of SEQ ID NO: 1-8051.

Probes may, for example, be used to determine whether specific mRNA molecules are present in a cell or tissue or to isolate similar nucleic acid sequences from chromosomal DNA as described by Walsh et al. (Walsh, P.S. et al., 1992, PCR Methods Appl 1:241-250). They may be labeled by nick translation, Klenow fill-in reaction, PCR, or other methods well known in the art. Probes of the present invention, their preparation and/or labeling are elaborated in Sambrook, J. et al., 1989, Molecular Cloning: A Laboratory Manual, Cold Spring Harbor Laboratory, NY; or Ausubel, F.M. et al., 1989, Current Protocols in Molecular Biology, John Wiley & Sons, New York NY, both of which are incorporated herein by reference in their entirety.

The nucleic acid sequences of the present invention also include the sequence information from the nucleic acid sequences of SEQ ID NO: 1-8051. The sequence information can be a segment of any one of SEQ ID NO: 1-8051 that uniquely identifies or represents the sequence information of that sequence of SEQ ID NO: 1-8051. One such segment can be a twenty-mer nucleic acid sequence because the probability that a twenty-mer is fully matched in the human genome is 1 in 300. In the human genome, there are three billion base pairs in one set of chromosomes. Because 4^{20} possible twenty-mers exist, there are 300 times more twenty-mers than there are base pairs in a set of human chromosomes. Using the same analysis, the probability for a seventeen-mer to be fully matched in the human genome is approximately 1 in 5. When these segments are used in arrays for expression studies, fifteen-mer segments can be used. The probability that the fifteen-mer is fully matched in the expressed sequences is also approximately one in five because expressed sequences comprise less than approximately 5% of the entire genome sequence.

Similarly, when using sequence information for detecting a single mismatch, a segment can be a twenty-five mer. The probability that the twenty-five mer would appear in a human genome with a single mismatch is calculated by multiplying the probability for a full match ($1 \div 4^{25}$) times the increased probability for mismatch at each nucleotide position (3 x 25). The probability that an

eighteen mer with a single mismatch can be detected in an array for expression studies is approximately one in five. The probability that a twenty-mer with a single mismatch can be detected in a human genome is approximately one in five.

The term "open reading frame," ORF, means a series of nucleotide triplets coding for amino acids without any termination codons and is a sequence translatable into protein.

The terms “operably linked” or “operably associated” refer to functionally related nucleic acid sequences. For example, a promoter is operably associated or operably linked with a coding sequence if the promoter controls the transcription of the coding sequence. While operably linked nucleic acid sequences can be contiguous and in the same reading frame, certain genetic elements *e.g.* repressor genes are not contiguously linked to the coding sequence but still control transcription/translation of the coding sequence.

The term “pluripotent” refers to the capability of a cell to differentiate into a number of differentiated cell types that are present in an adult organism. A pluripotent cell is restricted in its differentiation capability in comparison to a totipotent cell.

The terms “polypeptide” or “peptide” or “amino acid sequence” refer to an oligopeptide, peptide, polypeptide or protein sequence or fragment thereof and to naturally occurring or synthetic molecules. A polypeptide "fragment," "portion," or "segment" is a stretch of amino acid residues of at least about 5 amino acids, preferably at least about 7 amino acids, more preferably at least about 9 amino acids and most preferably at least about 17 or more amino acids. The peptide preferably is not greater than about 200 amino acids, more preferably less than 150 amino acids and most preferably less than 100 amino acids. Preferably the peptide is from about 5 to about 200 amino acids. To be active, any polypeptide must have sufficient length to display biological and/or immunological activity.

The term "naturally occurring polypeptide" refers to polypeptides produced by cells that have not been genetically engineered and specifically contemplates various polypeptides arising from post-translational modifications of the polypeptide including, but not limited to, acetylation, carboxylation, glycosylation, phosphorylation, lipidation and acylation.

The term “translated protein coding portion” means a sequence which encodes for the full length protein which may include any leader sequence or any processing sequence.

The term “mature protein coding sequence” means a sequence which encodes a peptide or protein without a signal or leader sequence. The “mature protein portion” means that portion of the protein which does not include a signal or leader sequence. The peptide may have been produced by processing in the cell which removes any leader/signal sequence. The mature protein portion may or may not include an initial methionine residue. The methionine residue may be removed from the protein during processing in the cell. The peptide may be produced

synthetically or the protein may have been produced using a polynucleotide only encoding for the mature protein coding sequence.

The term "derivative" refers to polypeptides chemically modified by such techniques as ubiquitination, labeling (*e.g.*, with radionuclides or various enzymes), covalent polymer attachment such as pegylation (derivatization with polyethylene glycol) and insertion or substitution by chemical synthesis of amino acids such as ornithine, which do not normally occur in human proteins.

The term "variant"(or "analog") refers to any polypeptide differing from naturally occurring polypeptides by amino acid insertions, deletions, and substitutions, created using, *e g.*, recombinant DNA techniques. Guidance in determining which amino acid residues may be replaced, added or deleted without abolishing activities of interest, may be found by comparing the sequence of the particular polypeptide with that of homologous peptides and minimizing the number of amino acid sequence changes made in regions of high homology (conserved regions) or by replacing amino acids with consensus sequence.

Alternatively, recombinant variants encoding these same or similar polypeptides may be synthesized or selected by making use of the "redundancy" in the genetic code. Various codon substitutions, such as the silent changes which produce various restriction sites, may be introduced to optimize cloning into a plasmid or viral vector or expression in a particular prokaryotic or eukaryotic system. Mutations in the polynucleotide sequence may be reflected in the polypeptide or domains of other peptides added to the polypeptide to modify the properties of any part of the polypeptide, to change characteristics such as ligand-binding affinities, interchain affinities, or degradation/turnover rate.

Preferably, amino acid "substitutions" are the result of replacing one amino acid with another amino acid having similar structural and/or chemical properties, *i.e.*, conservative amino acid replacements. "Conservative" amino acid substitutions may be made on the basis of similarity in polarity, charge, solubility, hydrophobicity, hydrophilicity, and/or the amphipathic nature of the residues involved. For example, nonpolar (hydrophobic) amino acids include alanine, leucine, isoleucine, valine, proline, phenylalanine, tryptophan, and methionine; polar neutral amino acids include glycine, serine, threonine, cysteine, tyrosine, asparagine, and glutamine; positively charged (basic) amino acids include arginine, lysine, and histidine; and negatively charged (acidic) amino acids include aspartic acid and glutamic acid. "Insertions" or "deletions" are preferably in the range of about 1 to 20 amino acids, more preferably 1 to 10 amino acids. The variation allowed may be experimentally determined by systematically making insertions, deletions, or substitutions of amino acids in a polypeptide molecule using recombinant DNA techniques and assaying the resulting recombinant variants for activity.

Alternatively, where alteration of function is desired, insertions, deletions or non-conservative alterations can be engineered to produce altered polypeptides. Such alterations can, for example, alter one or more of the biological functions or biochemical characteristics of the polypeptides of the invention. For example, such alterations may change polypeptide characteristics such as ligand-binding affinities, interchain affinities, or degradation/turnover rate. Further, such alterations can be selected so as to generate polypeptides that are better suited for expression, scale up and the like in the host cells chosen for expression. For example, cysteine residues can be deleted or substituted with another amino acid residue in order to eliminate disulfide bridges.

The terms "purified" or "substantially purified" as used herein denotes that the indicated nucleic acid or polypeptide is present in the substantial absence of other biological macromolecules, *e.g.*, polynucleotides, proteins, and the like. In one embodiment, the polynucleotide or polypeptide is purified such that it constitutes at least 95% by weight, more preferably at least 99% by weight, of the indicated biological macromolecules present (but water, buffers, and other small molecules, especially molecules having a molecular weight of less than 1000 daltons, can be present).

The term "isolated" as used herein refers to a nucleic acid or polypeptide separated from at least one other component (*e.g.*, nucleic acid or polypeptide) present with the nucleic acid or polypeptide in its natural source. In one embodiment, the nucleic acid or polypeptide is found in the presence of (if anything) only a solvent, buffer, ion, or other component normally present in a solution of the same. The terms "isolated" and "purified" do not encompass nucleic acids or polypeptides present in their natural source.

The term "recombinant," when used herein to refer to a polypeptide or protein, means that a polypeptide or protein is derived from recombinant (*e.g.*, microbial, insect, or mammalian) expression systems. "Microbial" refers to recombinant polypeptides or proteins made in bacterial or fungal (*e.g.*, yeast) expression systems. As a product, "recombinant microbial" defines a polypeptide or protein essentially free of native endogenous substances and unaccompanied by associated native glycosylation. Polypeptides or proteins expressed in most bacterial cultures, *e.g.*, *E. coli*, will be free of glycosylation modifications; polypeptides or proteins expressed in yeast will have a glycosylation pattern in general different from those expressed in mammalian cells.

The term "recombinant expression vehicle or vector" refers to a plasmid or phage or virus or vector, for expressing a polypeptide from a DNA (RNA) sequence. An expression vehicle can comprise a transcriptional unit comprising an assembly of (1) a genetic element or elements having a regulatory role in gene expression, for example, promoters or enhancers, (2) a structural

or coding sequence which is transcribed into mRNA and translated into protein, and (3) appropriate transcription initiation and termination sequences. Structural units intended for use in yeast or eukaryotic expression systems preferably include a leader sequence enabling extracellular secretion of translated protein by a host cell. Alternatively, where recombinant protein is expressed without a leader or transport sequence, it may include an amino terminal methionine residue. This residue may or may not be subsequently cleaved from the expressed reeombinant protein to provide a final product.

The term "recombinant expression system" means host cells which have stably integrated a recombinant transcriptional unit into chromosomal DNA or carry the recombinant transcriptional unit extrachromosomally. Recombinant expression systems as defined herein will express heterologous polypeptides or proteins upon induction of the regulatory elements linked to the DNA segment or synthetic gene to be expressed. This term also means host cells which have stably integrated a recombinant genetic element or elements having a regulatory role in gene expression, for example, promoters or enhancers. Recombinant expression systems as defined herein will express polypeptides or proteins endogenous to the cell upon induction of the regulatory elements linked to the endogenous DNA segment or gene to be expressed. The cells can be prokaryotic or eukaryotic.

The term "secreted" includes a protein that is transported across or through a membrane, including transport as a result of signal sequences in its amino acid sequence when it is expressed in a suitable host cell. "Secreted" proteins include without limitation proteins secreted wholly (*e.g.*, soluble proteins) or partially (*e.g.*, receptors) from the cell in which they are expressed. "Secreted" proteins also include without limitation proteins that are transported across the membrane of the endoplasmic reticulum. "Secreted" proteins are also intended to include proteins containing non-typical signal sequences (*e.g.* Interleukin-1 Beta, see Krasney, P.A. and Young, P.R. (1992) Cytokine 4(2):134 -143) and factors released from damaged cells (*e.g.* Interleukin-1 Receptor Antagonist, see Arend, W.P. et. al. (1998) Annu. Rev. Immunol. 16:27-55)

Where desired, an expression vector may be designed to contain a "signal or leader sequence" which will direct the polypeptide through the membrane of a cell. Such a sequence may be naturally present on the polypeptides of the present invention or provided from heterologous protein sources by recombinant DNA techniques.

The term "stringent" is used to refer to conditions that are commonly understood in the art as stringent. Stringent conditions can include highly stringent conditions (*i.e.*, hybridization to filter-bound DNA in 0.5 M $NaHPO_4$, 7% sodium dodecyl sulfate (SDS), 1 mM EDTA at 65°C, and washing in 0.1X SSC/0.1% SDS at 68°C), and moderately stringent conditions (*i.e.*,

washing in 0.2X SSC/0.1% SDS at 42°C). Other exemplary hybridization conditions are described herein in the examples.

In instances of hybridization of deoxyoligonucleotides, additional exemplary stringent hybridization conditions include washing in 6X SSC/0.05% sodium pyrophosphate at 37°C (for 14-base oligonucleotides), 48°C (for 17-base oligos), 55°C (for 20-base oligonucleotides), and 60°C (for 23-base oligonucleotides).

As used herein, "substantially equivalent" can refer both to nucleotide and amino acid sequences, for example a mutant sequence, that varies from a reference sequence by one or more substitutions, deletions, or additions, the net effect of which does not result in an adverse functional dissimilarity between the reference and subject sequences. Typically, such a substantially equivalent sequence varies from one of those listed herein by no more than about 35% (*i.e.*, the number of individual residue substitutions, additions, and/or deletions in a substantially equivalent sequence, as compared to the corresponding reference sequence, divided by the total number of residues in the substantially equivalent sequence is about 0.35 or less). Such a sequence is said to have 65% sequence identity to the listed sequence. In one embodiment, a substantially equivalent, *e.g.*, mutant, sequence of the invention varies from a listed sequence by no more than 30% (70% sequence identity); in a variation of this embodiment, by no more than 25% (75% sequence identity); and in a further variation of this embodiment, by no more than 20% (80% sequence identity) and in a further variation of this embodiment, by no more than 10% (90% sequence identity) and in a further variation of this embodiment, by no more that 5% (95% sequence identity). Substantially equivalent, *e.g.*, mutant, amino acid sequences according to the invention preferably have at least 80% sequence identity with a listed amino acid sequence, more preferably at least 85% sequence identity, more preferably at least 90% sequence identity, more preferably at least 95% identity, more preferably at least 98% identity, and most preferably at least 99% identity. Substantially equivalent nucleotide sequences of the invention can have lower percent sequence identities, taking into account, for example, the redundancy or degeneracy of the genetic code. Preferably, nucleotide sequence has at least about 65% identity, more preferably at least about 75% identity, more preferably at least about 80% sequence identity, more preferably at least about 85% sequence identity, more preferably at least about 90% sequence identity, and most preferably at least about 95% identity, more preferably at least about 98% sequence identity, and most preferably at least about 99% sequence identity. For the purposes of the present invention, sequences having substantially equivalent biological activity and substantially equivalent expression characteristics are considered substantially equivalent. For the purposes of determining equivalence, truncation of the mature sequence (*e.g.*, via a mutation which creates a spurious stop codon) should be

disregarded. Sequence identity may be determined, *e.g.*, using the Jotun Hein method (Hein, J. (1990) Methods Enzymol. 183:626-645). Identity between sequences can also be determined by other methods known in the art, *e.g.* by varying hybridization conditions.

The term "totipotent" refers to the capability of a cell to differentiate into all of the cell types of an adult organism.

The term "transformation" means introducing DNA into a suitable host cell so that the DNA is replicable, either as an extrachromosomal element, or by chromosomal integration. The term "transfection" refers to the taking up of an expression vector by a suitable host cell, whether or not any coding sequences are in fact expressed. The term "infection" refers to the introduction of nucleic acids into a suitable host cell by use of a virus or viral vector.

As used herein, an "uptake modulating fragment," UMF, means a series of nucleotides which mediate the uptake of a linked DNA fragment into a cell. UMFs can be readily identified using known UMFs as a target sequence or target motif with the computer-based systems described below. The presence and activity of a UMF can be confirmed by attaching the suspected UMF to a marker sequence. The resulting nucleic acid molecule is then incubated with an appropriate host under appropriate conditions and the uptake of the marker sequence is determined. As described above, a UMF will increase the frequency of uptake of a linked marker sequence.

Each of the above terms is meant to encompass all that is described for each, unless the context dictates otherwise.

4.2 NUCLEIC ACIDS OF THE INVENTION

Nucleotide sequences of the invention are set forth in the Sequence Listing.

The isolated polynucleotides of the invention include a polynucleotide comprising the nucleotide sequences of SEQ ID NO: 1-8051; a polynucleotide encoding any one of the peptide sequences of SEQ ID NO: 8052-16102; and a polynucleotide comprising the nucleotide sequence encoding the mature protein coding sequence of the polypeptides of any one of SEQ ID NO: 8052-16102. The polynucleotides of the present invention also include, but are not limited to, a polynucleotide that hybridizes under stringent conditions to (a) the complement of any of the nucleotides sequences of SEQ ID NO: 1-8051; (b) nucleotide sequences encoding any one of the amino acid sequences set forth in the Sequence Listing; (c) a polynucleotide which is an allelic variant of any polynucleotide recited above; (d) a polynucleotide which encodes a speeies homolog of any of the proteins recited above; or (e) a polynucleotide that encodes a polypeptide comprising a specific domain or truncation of the polypeptides of SEQ ID NO: 8052-16102. Domains of interest may depend on the nature of the encoded polypeptide; *e.g.*, domains in

receptor-like polypeptides include ligand-binding, extracellular, transmembrane, or cytoplasmic domains, or combinations thereof; domains in immunoglobulin-like proteins include the variable immunoglobulin-like domains; domains in enzyme-like polypeptides include catalytic and substrate binding domains; and domains in ligand polypeptides include receptor-binding domains.

The polynucleotides of the invention include naturally occurring or wholly or partially synthetic DNA, *e.g.*, cDNA and genomic DNA, and RNA, *e.g.*, mRNA. The polynucleotides may include all of the coding region of the cDNA or may represent a portion of the coding region of the cDNA.

The present invention also provides genes corresponding to the cDNA sequences disclosed herein. The corresponding genes can be isolated in accordance with known methods using the sequence information disclosed herein. Such methods include the preparation of probes or primers from the disclosed sequence information for identification and/or amplification of genes in appropriate genomic libraries or other sources of genomic materials. Further 5' and 3' sequence can be obtained using methods known in the art. For example, full length cDNA or genomic DNA that corresponds to any of the polynucleotides of SEQ ID NO: 1-8051 can be obtained by screening appropriate cDNA or genomic DNA libraries under suitable hybridization conditions using any of the polynucleotides of SEQ ID NO: 1-8051 or a portion thereof as a probe. Alternatively, the polynucleotides of SEQ ID NO: 1-8051 may be used as the basis for suitable primer(s) that allow identification and/or amplification of genes in appropriate genomic DNA or cDNA libraries.

The nucleic acid sequences of the invention can be assembled from ESTs and sequences (including cDNA and genomic sequences) obtained from one or more public databases, such as dbEST, gbpri, and UniGene. The EST sequences can provide identifying sequence information, representative fragment or segment information, or novel segment information for the full-length gene.

The polynucleotides of the invention also provide polynucleotides including nucleotide sequences that are substantially equivalent to the polynucleotides recited above. Polynucleotides according to the invention can have, *e.g.*, at least about 65%, at least about 70%, at least about 75%, at least about 80%, 81%, 82%, 83%, 84%, more typically at least about 85%, 86%, 87%, 88%, 89%, more typically at least about 90%, 91%, 92%, 93%, 94%, and even more typically at least about 95%, 96%, 97%, 98%, 99%, sequence identity to a polynucleotide recited above.

Included within the scope of the nucleic acid sequences of the invention are nucleic acid sequence fragments that hybridize under stringent conditions to any of the nucleotide sequences of SEQ ID NO: 1-8051, or complements thereof, which fragment is greater than about 5 nucleotides, preferably 7 nucleotides, more preferably greater than 9 nucleotides and most

preferably greater than 17 nucleotides. Fragments of, *e.g.* 15, 17, or 20 nucleotides or more that are selective for (*i.e.* specifically hybridize to any one of the polynucleotides of the invention) are contemplated. Probes capable of specifically hybridizing to a polynucleotide can differentiate polynucleotide sequences of the invention from other polynucleotide sequences in the same family of genes or can differentiate human genes from genes of other species, and are preferably based on unique nucleotide sequences.

The sequences falling within the scope of the present invention are not limited to these specific sequences, but also include allelic and species variations thereof. Allelic and species variations can be routinely determined by comparing the sequence provided in SEQ ID NO: 1-8051, a representative fragment thereof, or a nucleotide sequence at least 90% identical, preferably 95% identical, to SEQ ID NO: 1-8051 with a sequence from another isolate of the same species. Furthermore, to accommodate codon variability, the invention includes nucleic acid molecules coding for the same amino acid sequences as do the specific ORFs disclosed herein. In other words, in the coding region of an ORF, substitution of one codon for another codon that encodes the same amino acid is expressly contemplated.

The nearest neighbor or homology result for the nucleic acids of the present invention, including SEQ ID NO: 1-8051 can be obtained by searching a database using an algorithm or a program. Preferably, a BLAST which stands for Basic Local Alignment Search Tool is used to search for local sequence alignments (Altshul, S.F. J Mol. Evol. 36 290-300 (1993) and Altschul S.F. et al. J. Mol. Biol. 21:403-410 (1990)). Alternatively a FASTA version 3 search against Genpept, using Fastxy algorithm.

Species homologs (or orthologs) of the disclosed polynucleotides and proteins are also provided by the present invention. Species homologs may be isolated and identified by making suitable probes or primers from the sequences provided herein and screening a suitable nucleic acid source from the desired species.

The invention also encompasses allelic variants of the disclosed polynucleotides or proteins; that is, naturally occurring alternative forms of the isolated polynucleotide which also encode proteins which are identical, homologous or related to that encoded by the polynucleotides.

The nucleic acid sequences of the invention are further directed to sequences whieh encode variants of the described nucleic acids. These amino acid sequence variants may be prepared by methods known in the art by introducing appropriate nucleotide changes into a native or variant polynucleotide. There are two variables in the construction of amino acid sequence variants: the location of the mutation and the nature of the mutation. Nucleic acids encoding the amino acid sequence variants are preferably constructed by mutating the

polynucleotide to encode an amino acid sequence that does not occur in nature. These nucleic acid alterations can be made at sites that differ in the nucleic acids from different species (variable positions) or in highly conserved regions (constant regions). Sites at such locations will typically be modified in series, *e.g.*, by substituting first with conservative choices (*e.g.*, hydrophobic amino acid to a different hydrophobic amino acid) and then with more distant choices (*e.g.*, hydrophobic amino acid to a charged amino acid), and then deletions or insertions may be made at the target site. Amino acid sequence deletions generally range from about 1 to 30 residues, preferably about 1 to 10 residues, and are typically contiguous. Amino acid insertions include amino- and/or carboxyl-terminal fusions ranging in length from one to one hundred or more residues, as well as intrasequence insertions of single or multiple amino acid residues. Intrasequence insertions may range generally from about 1 to 10 amino residues, preferably from 1 to 5 residues. Examples of terminal insertions include the heterologous signal sequences necessary for secretion or for intracellular targeting in different host cells and sequences such as FLAG or poly-histidine sequences useful for purifying the expressed protein.

In a preferred method, polynucleotides encoding the novel amino acid sequences are changed via site-directed mutagenesis. This method uses oligonucleotide sequences to alter a polynucleotide to encode the desired amino acid variant, as well as sufficient adjacent nucleotides on both sides of the changed amino acid to form a stable duplex on either side of the site of being changed. In general, the techniques of site-directed mutagenesis are well known to those of skill in the art and this technique is exemplified by publications such as, Edelman et al., *DNA* 2:183 (1983). A versatile and efficient method for producing site-specific changes in a polynucleotide sequence was published by Zoller and Smith, *Nucleic Acids Res.* 10:6487-6500 (1982). PCR may also be used to create amino acid sequence variants of the novel nucleic acids. When small amounts of template DNA are used as starting material, primer(s) that differs slightly in sequence from the corresponding region in the template DNA can generate the desired amino acid variant. PCR amplification results in a population of product DNA fragments that differ from the polynucleotide template encoding the polypeptide at the position specified by the primer. The product DNA fragments replace the corresponding region in the plasmid and this gives a polynucleotide encoding the desired amino acid variant.

A further technique for generating amino acid variants is the cassette mutagenesis technique described in Wells et al., *Gene* 34:315 (1985); and other mutagenesis techniques well known in the art, such as, for example, the techniques in Sambrook et al., supra, and *Current Protocols in Molecular Biology*, Ausubel et al. Due to the inherent degeneracy of the genetic code, other DNA sequences which encode substantially the same or a functionally equivalent amino acid sequence may be used in the practice of the invention for the cloning and expression

of these novel nucleic acids. Such DNA sequences include those which are capable of hybridizing to the appropriate novel nucleic acid sequence under stringent conditions.

Polynucleotides encoding preferred polypeptide truncations of the invention can be used to generate polynucleotides encoding chimeric or fusion proteins comprising one or more domains of the invention and heterologous protein sequences.

The polynucleotides of the invention additionally include the complement of any of the polynucleotides recited above. The polynucleotide can be DNA (genomic, cDNA, amplified, or synthetic) or RNA. Methods and algorithms for obtaining such polynucleotides are well known to those of skill in the art and can include, for example, methods for determining hybridization conditions that can routinely isolate polynucleotides of the desired sequence identities.

In accordance with the invention, polynucleotide sequences comprising the mature protein coding sequences corresponding to any one of SEQ ID NO: 1-8051, or functional equivalents thereof, may be used to generate recombinant DNA molecules that direct the expression of that nucleic acid, or a functional equivalent thereof, in appropriate host cells. Also included are the cDNA inserts of any of the clones identified herein.

A polynucleotide according to the invention can be joined to any of a variety of other nucleotide sequences by well-established recombinant DNA techniques (see Sambrook J et al. (1989) Molecular Cloning: A Laboratory Manual, Cold Spring Harbor Laboratory, NY). Useful nucleotide sequences for joining to polynucleotides include an assortment of vectors, *e.g.*, plasmids, cosmids, lambda phage derivatives, phagemids, and the like, that are well known in the art. Accordingly, the invention also provides a vector including a polynucleotide of the invention and a host cell containing the polynucleotide. In general, the vector contains an origin of replication functional in at least one organism, convenient restriction endonuclease sites, and a selectable marker for the host cell. Vectors according to the invention include expression vectors, replication vectors, probe generation vectors, and sequencing vectors. A host cell according to the invention can be a prokaryotic or eukaryotic cell and can be a unicellular organism or part of a multicellular organism.

The present invention further provides recombinant constructs comprising a nucleic acid having any of the nucleotide sequences of SEQ ID NO: 1-8051 or a fragment thereof or any other polynucleotides of the invention. In one embodiment, the recombinant constructs of the present invention comprise a vector, such as a plasmid or viral vector, into which a nucleic acid having any of the nucleotide sequences of SEQ ID NO: 1-8051 or a fragment thereof is inserted, in a forward or reverse orientation. In the case of a vector comprising one of the ORFs of the present invention, the vector may further comprise regulatory sequences, including for example, a promoter, operably linked to the ORF. Large numbers of suitable vectors and promoters are

known to those of skill in the art and are commercially available for generating the recombinant constructs of the present invention. The following vectors are provided by way of example. Bacterial: pBs, phagescript, PsiX174, pBluescript SK, pBs KS, pNH8a, pNH16a, pNH18a, pNH46a (Stratagene); pTrc99A, pKK223-3, pKK233-3, pDR540, pRIT5 (Pharmacia). Eukaryotic: pWLneo, pSV2cat, pOG44, PXTI, pSG (Stratagene) pSVK3, pBPV, pMSG, pSVL (Pharmacia).

The isolated polynucleotide of the invention may be operably linked to an expression control sequence such as the pMT2 or pED expression vectors disclosed in Kaufman et al., *Nucleic Acids Res.* 19, 4485-4490 (1991), in order to produce the protein recombinantly. Many suitable expression control sequences are known in the art. General methods of expressing recombinant proteins are also known and are exemplified in R. Kaufman, *Methods in Enzymology* 185, 537-566 (1990). As defined herein "operably linked" means that the isolated polynucleotide of the invention and an expression control sequence are situated within a vector or cell in such a way that the protein is expressed by a host cell which has been transformed (transfected) with the ligated polynucleotide/expression control sequence.

Promoter regions can be selected from any desired gene using CAT (chloramphenicol transferase) vectors or other vectors with selectable markers. Two appropriate vectors are pKK232-8 and pCM7. Particular named bacterial promoters include lacI, lacZ, T3, T7, gpt, lambda PR, and trc. Eukaryotic promoters include CMV immediate early, HSV thymidine kinase, early and late SV40, LTRs from retrovirus, and mouse metallothionein-I. Selection of the appropriate vector and promoter is well within the level of ordinary skill in the art. Generally, recombinant expression vectors will include origins of replication and selectable markers permitting transformation of the host cell, *e.g.*, the ampicillin resistance gene of *E. coli* and *S. cerevisiae* TRP1 gene, and a promoter derived from a highly-expressed gene to direct transcription of a downstream structural sequence. Such promoters can be derived from operons encoding glycolytic enzymes such as 3-phosphoglycerate kinase (PGK), a-factor, acid phosphatase, or heat shock proteins, among others. The heterologous structural sequence is assembled in appropriate phase with translation initiation and termination sequences, and preferably, a leader sequence capable of directing secretion of translated protein into the periplasmic space or extracellular medium. Optionally, the heterologous sequence can encode a fusion protein including an amino terminal identification peptide imparting desired characteristics, *e.g.*, stabilization or simplified purification of expressed recombinant product. Useful expression vectors for bacterial use are constructed by inserting a structural DNA sequence encoding a desired protein together with suitable translation initiation and termination signals in operable reading phase with a functional promoter. The vector will comprise one or

more phenotypic selectable markers and an origin of replication to ensure maintenance of the vector and to, if desirable, provide amplification within the host. Suitable prokaryotic hosts for transformation include *E. coli*, *Bacillus subtilis*, *Salmonella typhimurium* and various species within the genera *Pseudomonas*, *Streptomyces*, and *Staphylococcus*, although others may also be employed as a matter of choice.

As a representative but non-limiting example, useful expression vectors for bacterial use can comprise a selectable marker and bacterial origin of replication derived from commercially available plasmids comprising genetic elements of the well known cloning vector pBR322 (ATCC 37017). Such commercial vectors include, for example, pKK223-3 (Pharmacia Fine Chemicals, Uppsala, Sweden) and GEM 1 (Promega Biotech, Madison, WI, USA). These pBR322 "backbone" sections are combined with an appropriate promoter and the structural sequence to be expressed. Following transformation of a suitable host strain and growth of the host strain to an appropriate cell density, the selected promoter is induced or derepressed by appropriate means (*e.g.*, temperature shift or chemical induction) and cells are cultured for an additional period. Cells are typically harvested by centrifugation, disrupted by physical or chemical means, and the resulting crude extract retained for further purification.

Polynucleotides of the invention can also be used to induce immune responses. For example, as described in Fan et al., *Nat. Biotech.* 17:870-872 (1999), incorporated herein by reference, nucleic acid sequences encoding a polypeptide may be used to generate antibodies against the encoded polypeptide following topical administration of naked plasmid DNA or following injection, and preferably intramuscular injection of the DNA. The nucleic acid sequences are preferably inserted in a recombinant expression vector and may be in the form of naked DNA.

4.3 ANTISENSE

Another aspect of the invention pertains to isolated antisense nucleic acid molecules that are hybridizable to or complementary to the nucleic acid molecule comprising the nucleotide sequence of SEQ ID NO: 1-8051, or fragments, analogs or derivatives thereof. An "antisense" nucleic acid comprises a nucleotide sequence that is complementary to a "sense" nucleic acid encoding a protein, *e.g.*, complementary to the coding strand of a double-stranded cDNA molecule or complementary to an mRNA sequence. In specific aspects, antisense nucleic acid molecules are provided that comprise a sequence complementary to at least about 10, 25, 50, 100, 250 or 500 nucleotides or an entire coding strand, or to only a portion thereof. Nucleic acid molecules encoding fragments, homologs, derivatives and analogs of a protein of any of SEQ ID

NO: 8052-16102 or antisense nucleic acids complementary to a nucleic acid sequence of SEQ ID NO: 1-8051 are additionally provided.

In one embodiment, an antisense nucleic acid molecule is antisense to a "coding region" of the coding strand of a nucleotide sequence of the invention. The term "coding region" refers to the region of the nucleotide sequence comprising codons which are translated into amino acid residues. In another embodiment, the antisense nucleic acid molecule is antisense to a "noncoding region" of the coding strand of a nucleotide sequence of the invention. The term "noncoding region" refers to 5' and 3' sequences which flank the coding region that are not translated into amino acids (*i.e.*, also referred to as 5' and 3' untranslated regions).

Given the coding strand sequences encoding a nucleic acid disclosed herein (*e.g.*, SEQ ID NO: 1-8051), antisense nucleic acids of the invention can be designed according to the rules of Watson and Crick or Hoogsteen base pairing. The antisense nucleic acid molecule can be complementary to the entire coding region of a mRNA, but more preferably is an oligonucleotide that is antisense to only a portion of the coding or noncoding region of a mRNA. For example, the antisense oligonucleotide can be complementary to the region surrounding the translation start site of a mRNA. An antisense oligonucleotide can be, for example, about 5, 10, 15, 20, 25, 30, 35, 40, 45 or 50 nucleotides in length. An antisense nucleic acid of the invention can be constructed using chemical synthesis or enzymatic ligation reactions using procedures known in the art. For example, an antisense nucleic acid (*e.g.*, an antisense oligonucleotide) can be chemically synthesized using naturally occurring nucleotides or variously modified nucleotides designed to increase the biological stability of the molecules or to increase the physical stability of the duplex formed between the antisense and sense nucleic acids, *e.g.*, phosphorothioate derivatives and acridine substituted nucleotides can be used.

Examples of modified nucleotides that can be used to generate the antisense nucleic acid include: 5-fluorouracil, 5-bromouracil, 5-chlorouracil, 5-iodouracil, hypoxanthine, xanthine, 4-acetylcytosine, 5-(carboxyhydroxylmethyl) uracil, 5-carboxymethylaminomethyl-2-thiouridine, 5-carboxymethylaminomethyluracil, dihydrouracil, beta-D-galactosylqueosine, inosine, N6-isopentenyladenine, 1-methylguanine, 1-methylinosine, 2,2-dimethylguanine, 2-methyladenine, 2-methylguanine, 3-methylcytosine, 5-methylcytosine, N6-adenine, 7-methylguanine, 5-methylaminomethyluracil, 5-methoxyaminomethyl-2-thiouracil, beta-D-mannosylqueosine, 5'-methoxycarboxymethyluracil, 5-methoxyuracil, 2-methylthio-N6-isopentenyladenine, uracil-5-oxyacetic acid (v), wybutoxosine, pseudouracil, queosine, 2-thiocytosine, 5-methyl-2-thiouracil, 2-thiouracil, 4-thiouracil, 5-methyluracil, uracil-5-oxyacetic acid methylester, uracil-5-oxyacetic acid (v), 5-methyl-2-thiouracil, 3-(3-amino-3-N-2-carboxypropyl) uracil, (acp3)w, and 2,6-diaminopurine. Alternatively, the

antisense nucleic acid can be produced biologically using an expression vector into which a nucleic acid has been subcloned in an antisense orientation (*i.e.*, RNA transcribed from the inserted nucleic acid will be of an antisense orientation to a target nucleic acid of interest, described further in the following subsection).

The antisense nucleic acid molecules of the invention are typically administered to a subject or generated *in situ* such that they hybridize with or bind to cellular mRNA and/or genomic DNA encoding a protein according to the invention to thereby inhibit expression of the protein, *e.g.*, by inhibiting transcription and/or translation. The hybridization can be by conventional nucleotide complementarity to form a stable duplex, or, for example, in the case of an antisense nucleic acid molecule that binds to DNA duplexes, through specific interactions in the major groove of the double helix. An example of a route of administration of antisense nucleic acid molecules of the invention includes direct injection at a tissue site. Alternatively, antisense nucleic acid molecules can be modified to target selected cells and then administered systemically. For example, for systemic administration, antisense molecules can be modified such that they specifically bind to receptors or antigens expressed on a selected cell surface, *e.g.*, by linking the antisense nucleic acid molecules to peptides or antibodies that bind to cell surface receptors or antigens. The antisense nucleic acid molecules can also be delivered to cells using the vectors described herein. To achieve sufficient intracellular concentrations of antisense molecules, vector constructs in which the antisense nucleic acid molecule is placed under the control of a strong pol II or pol III promoter are preferred.

In yet another embodiment, the antisense nucleic acid molecule of the invention is an α-anomeric nucleic acid molecule. An α-anomeric nucleic acid molecule forms specific double-stranded hybrids with complementary RNA in which, contrary to the usual α-units, the strands run parallel to each other (Gaultier *et al.* (1987) *Nucleic Acids Res* 15: 6625-6641). The antisense nucleic acid molecule can also comprise a 2'-o-methylribonucleotide (Inoue *et al.* (1987) *Nucleic Acids Res* 15: 6131-6148) or a chimeric RNA -DNA analogue (Inoue *et al.* (1987) *FEBS Lett* 215: 327-330).

4.4 RIBOZYMES AND PNA MOIETIES

In still another embodiment, an antisense nucleic acid of the invention is a ribozyme. Ribozymes are catalytic RNA molecules with ribonuclease activity that are capable of cleaving a single-stranded nucleic acid, such as a mRNA, to which they have a complementary region. Thus, ribozymes (*e.g.*, hammerhead ribozymes (described in Haselhoff and Gerlach (1988) *Nature* 334:585-591)) can be used to catalytically cleave a mRNA transcripts to thereby inhibit translation of a mRNA. A ribozyme having specificity for a nucleic acid of the invention can be

designed based upon the nucleotide sequence of a DNA disclosed herein (*i.e.*, SEQ ID NO: 1-8051). For example, a derivative of a Tetrahymena L-19 IVS RNA can be constructed in which the nucleotide sequence of the active site is complementary to the nucleotide sequence to be cleaved in an mRNA of SEQ ID NO: 1-8051 (see, *e.g.*, Cech *et al.* U.S. Pat. No. 4,987,071; and Cech *et al.* U.S. Pat. No. 5,116,742). Alternatively, polynucleotides of the invention can be used to select a catalytic RNA having a specific ribonuclease activity from a pool of RNA molecules. See, *e.g.*, Bartel *et al.*, (1993) *Science* 261:1411-1418.

Alternatively, gene expression can be inhibited by targeting nucleotide sequences complementary to the regulatory region (*e.g.*, promoter and/or enhancers) to form triple helical structures that prevent transcription of the gene in target cells. See generally, Helene. (1991) *Anticancer Drug Des.* 6: 569-84; Helene. *et al.* (1992) *Ann. N.Y. Acad. Sci.* 660:27-36; and Maher (1992) *Bioassays* 14: 807-15.

In various embodiments, the nucleic acids of the invention can be modified at the base moiety, sugar moiety or phosphate backbone to improve, *e.g.*, the stability, hybridization, or solubility of the molecule. For example, the deoxyribose phosphate backbone of the nucleic acids can be modified to generate peptide nucleic acids (see Hyrup *et al.* (1996) *Bioorg Med Chem* 4: 5-23). As used herein, the terms "peptide nucleic acids" or "PNAs" refer to nucleic acid mimics, *e.g.*, DNA mimics, in which the deoxyribose phosphate backbone is replaced by a pseudopeptide backbone and only the four natural nucleobases are retained. The neutral backbone of PNAs has been shown to allow for specific hybridization to DNA and RNA under conditions of low ionic strength. The synthesis of PNA oligomers can be performed using standard solid phase peptide synthesis protocols as described in Hyrup *et al.* (1996) above; Perry-O'Keefe *et al.* (1996) *PNAS* 93: 14670-675.

PNAs of the invention can be used in therapeutic and diagnostic applications. For example, PNAs can be used as antisense or antigene agents for sequence-specific modulation of gene expression by, *e.g.*, inducing transcription or translation arrest or inhibiting replication. PNAs of the invention can also be used, *e.g.*, in the analysis of single base pair mutations in a gene by, *e.g.*, PNA directed PCR clamping; as artificial restriction enzymes when used in combination with other enzymes, *e.g.*, S1 nucleases (Hyrup B. (1996) above); or as probes or primers for DNA sequence and hybridization (Hyrup *et al.* (1996), above; Perry-O'Keefe (1996), above).

In another embodiment, PNAs of the invention can be modified, *e.g.*, to enhance their stability or cellular uptake, by attaching lipophilic or other helper groups to PNA, by the formation of PNA-DNA chimeras, or by the use of liposomes or other techniques of drug delivery known in the art. For example, PNA-DNA chimeras can be generated that may

combine the advantageous properties of PNA and DNA. Such chimeras allow DNA recognition enzymes, *e.g.*, RNase H and DNA polymerases, to interact with the DNA portion while the PNA portion would provide high binding affinity and specificity. PNA-DNA chimeras can be linked using linkers of appropriate lengths selected in terms of base stacking, number of bonds between the nucleobases, and orientation (Hyrup (1996) above). The synthesis of PNA-DNA chimeras can be performed as described in Hyrup (1996) above and Finn *et al.* (1996) *Nucl Acids Res* 24: 3357-63. For example, a DNA chain can be synthesized on a solid support using standard phosphoramidite coupling chemistry, and modified nucleoside analogs, *e.g.*, 5'-(4-methoxytrityl)amino-5'-deoxy-thymidine phosphoramidite, can be used between the PNA and the 5' end of DNA (Mag *et al.* (1989) *Nucl Acid Res* 17: 5973-88). PNA monomers are then coupled in a stepwise manner to produce a chimeric molecule with a 5' PNA segment and a 3' DNA segment (Finn *et al.* (1996) above). Alternatively, chimeric molecules can be synthesized with a 5' DNA segment and a 3' PNA segment. See, Petersen *et al.* (1975) *Bioorg Med Chem Lett* 5: 1119-11124.

In other embodiments, the oligonucleotide may include other appended groups such as peptides (*e.g.*, for targeting host cell receptors *in vivo*), or agents facilitating transport across the cell membrane (see, *e.g.*, Letsinger *et al.*, 1989, *Proc. Natl. Acad. Sci. U.S.A.* 86:6553-6556; Lemaitre *et al.*, 1987, Proc. *Natl. Acad. Sci.* 84:648-652; PCT Publication No. W088/09810) or the blood-brain barrier (see, *e.g.*, PCT Publication No. W089/10134). In addition, oligonucleotides can be modified with hybridization triggered cleavage agents (See, *e.g.*, Krol *et al.*, 1988, *BioTechniques* 6:958-976) or intercalating agents (see, *e.g.*, Zon, 1988, *Pharm. Res.* 5:539-549). To this end, the oligonucleotide may be conjugated to another molecule, *e.g.*, a peptide, a hybridization triggered cross-linking agent, a transport agent, a hybridization-triggered cleavage agent, etc.

4.5 HOSTS

The present invention further provides host cells genetically engineered to contain the polynucleotides of the invention. For example, such host cells may contain nucleic acids of the invention introduced into the host cell using known transformation, transfection or infection methods. The present invention still further provides host cells genetically engineered to express the polynucleotides of the invention, wherein such polynucleotides are in operative association with a regulatory sequence heterologous to the host cell which drives expression of the polynucleotides in the cell.

Knowledge of nucleic acid sequences allows for modification of cells to permit, or increase, expression of endogenous polypeptide. Cells can be modified (*e.g.*, by homologous

recombination) to provide increased polypeptide expression by replacing, in whole or in part, the naturally occurring promoter with all or part of a heterologous promoter so that the cells express the polypeptide at higher levels. The heterologous promoter is inserted in such a manner that it is operatively linked to the encoding sequences. See, for example, PCT International Publication No. WO94/12650, PCT International Publication No. WO92/20808, and PCT International Publication No. WO91/09955. It is also contemplated that, in addition to heterologous promoter DNA, amplifiable marker DNA (*e.g.*, ada, dhfr, and the multifunctional CAD gene which encodes carbamyl phosphate synthase, aspartate transcarbamylase, and dihydroorotase) and/or intron DNA may be inserted along with the heterologous promoter DNA. If linked to the coding sequence, amplification of the marker DNA by standard selection methods results in co-amplification of the desired protein coding sequences in the cells.

The host cell can be a higher eukaryotic host cell, such as a mammalian cell, a lower eukaryotic host cell, such as a yeast cell, or the host cell can be a prokaryotic cell, such as a bacterial cell. Introduction of the recombinant construct into the host cell can be effected by calcium phosphate transfection, DEAE, dextran mediated transfection, or electroporation (Davis, L. et al., *Basic Methods in Molecular Biology* (1986)). The host cells containing one of the polynucleotides of the invention, can be used in conventional manners to produce the gene product encoded by the isolated fragment (in the case of an ORF) or can be used to produce a heterologous protein under the control of the EMF.

Any host/vector system can be used to express one or more of the ORFs of the present invention. These include, but are not limited to, eukaryotic hosts such as HeLa cells, Cv-1 cell, COS cells, 293 cells, and Sf9 cells, as well as prokaryotic host such as *E. coli* and *B. subtilis*. The most preferred cells are those which do not normally express the particular polypeptide or protein or which expresses the polypeptide or protein at low natural level. Mature proteins can be expressed in mammalian cells, yeast, bacteria, or other cells under the control of appropriate promoters. Cell-free translation systems can also be employed to produce such proteins using RNAs derived from the DNA constructs of the present invention. Appropriate cloning and expression vectors for use with prokaryotic and eukaryotic hosts are described by Sambrook, et al., in Molecular Cloning: A Laboratory Manual, Second Edition, Cold Spring Harbor, New York (1989), the disclosure of which is hereby incorporated by reference.

Various mammalian cell culture systems can also be employed to express recombinant protein. Examples of mammalian expression systems include the COS-7 lines of monkey kidney fibroblasts, described by Gluzman, Cell 23:175 (1981). Other cell lines capable of expressing a compatible vector are, for example, the C127, monkey COS cells, Chinese Hamster Ovary (CHO) cells, human kidney 293 cells, human epidermal A431 cells, human Colo205 cells, 3T3

cells, CV-1 cells, other transformed primate cell lines, normal diploid cells, cell strains derived from *in vitro* culture of primary tissue, primary explants, HeLa cells, mouse L cells, BHK, HL-60, U937, HaK or Jurkat cells. Mammalian expression vectors will comprise an origin of replication, a suitable promoter and also any necessary ribosome binding sites, polyadenylation site, splice donor and acceptor sites, transcriptional termination sequences, and 5′ flanking nontranscribed sequences. DNA sequences derived from the SV40 viral genome, for example, SV40 origin, early promoter, enhancer, splice, and polyadenylation sites may be used to provide the required nontranscribed genetic elements. Recombinant polypeptides and proteins produced in bacterial culture are usually isolated by initial extraction from cell pellets, followed by one or more salting-out, aqueous ion exchange or size exclusion chromatography steps. Protein refolding steps can be used, as necessary, in completing configuration of the mature protein. Finally, high performance liquid chromatography (HPLC) can be employed for final purification steps. Microbial cells employed in expression of proteins can be disrupted by any convenient method, including freeze-thaw cycling, sonication, mechanical disruption, or use of cell lysing agents.

Alternatively, it may be possible to produce the protein in lower eukaryotes such as yeast or insects or in prokaryotes such as bacteria. Potentially suitable yeast strains include *Saccharomyces cerevisiae*, *Schizosaccharomyces pombe*, *Kluyveromyces* strains, *Candida*, or any yeast strain capable of expressing heterologous proteins. Potentially suitable bacterial strains include *Escherichia coli*, *Bacillus subtilis*, *Salmonella typhimurium*, or any bacterial strain capable of expressing heterologous proteins. If the protein is made in yeast or bacteria, it may be necessary to modify the protein produced therein, for example by phosphorylation or glycosylation of the appropriate sites, in order to obtain the functional protein. Such covalent attachments may be accomplished using known chemical or enzymatic methods.

In another embodiment of the present invention, cells and tissues may be engineered to express an endogenous gene comprising the polynucleotides of the invention under the control of inducible regulatory elements, in which case the regulatory sequences of the endogenous gene may be replaced by homologous recombination. As described herein, gene targeting can be used to replace a gene's existing regulatory region with a regulatory sequence isolated from a different gene or a novel regulatory sequence synthesized by genetic engineering methods. Such regulatory sequences may be comprised of promoters, enhancers, scaffold-attachment regions, negative regulatory elements, transcriptional initiation sites, regulatory protein binding sites or combinations of said sequences. Alternatively, sequences which affect the structure or stability of the RNA or protein produced may be replaced, removed, added, or otherwise modified by targeting. These sequence include polyadenylation signals, mRNA stability elements, splice

sites, leader sequences for enhancing or modifying transport or secretion properties of the protein, or other sequences which alter or improve the function or stability of protein or RNA molecules.

The targeting event may be a simple insertion of the regulatory sequence, placing the gene under the control of the new regulatory sequence, *e.g.*, inserting a new promoter or enhancer or both upstream of a gene. Alternatively, the targeting event may be a simple deletion of a regulatory element, such as the deletion of a tissue-specific negative regulatory element. Alternatively, the targeting event may replace an existing element; for example, a tissue-specific enhancer can be replaced by an enhancer that has broader or different cell-type specificity than the naturally occurring elements. Here, the naturally occurring sequences are deleted and new sequences are added. In all cases, the identification of the targeting event may be facilitated by the use of one or more selectable marker genes that are contiguous with the targeting DNA, allowing for the selection of cells in which the exogenous DNA has integrated into the host cell genome. The identification of the targeting event may also be facilitated by the use of one or more marker genes exhibiting the property of negative selection, such that the negatively selectable marker is linked to the exogenous DNA, but configured such that the negatively selectable marker flanks the targeting sequence, and such that a correct homologous recombination event with sequences in the host cell genome does not result in the stable integration of the negatively selectable marker. Markers useful for this purpose include the Herpes Simplex Virus thymidine kinase (TK) gene or the bacterial xanthine-guanine phosphoribosyl-transferase (gpt) gene.

The gene targeting or gene activation techniques which can be used in accordance with this aspect of the invention are more particularly described in U.S. Patent No. 5,272,071 to Chappel; U.S. Patent No. 5,578,461 to Sherwin et al.; International Application No. PCT/US92/09627 (WO93/09222) by Selden et al.; and International Application No. PCT/US90/06436 (WO91/06667) by Skoultchi et al., each of which is incorporated by reference herein in its entirety.

4.6 POLYPEPTIDES OF THE INVENTION

The isolated polypeptides of the invention include, but are not limited to, a polypeptide comprising: the amino acid sequences set forth as any one of SEQ ID NO: 8052-16102 or an amino acid sequence encoded by any one of the nucleotide sequences SEQ ID NO: 1-8051 or the corresponding full length or mature protein. Polypeptides of the invention also include polypeptides preferably with biological or immunological activity that are encoded by: (a) a polynucleotide having any one of the nucleotide sequences set forth in SEQ ID NO: 1-8051 or

(b) polynucleotides encoding any one of the amino acid sequences set forth as SEQ ID NO: 8052-16102 or (c) polynucleotides that hybridize to the complement of the polynucleotides of either (a) or (b) under stringent hybridization conditions. The invention also provides biologically active or immunologically active variants of any of the amino acid sequences set forth as SEQ ID NO: 8052-16102 or the corresponding full length or mature protein; and "substantial equivalents" thereof (*e.g.*, with at least about 65%, at least about 70%, at least about 75%, at least about 80%, at least about 85%, 86%, 87%, 88%, 89%, at least about 90%, 91%, 92%, 93%, 94%, typically at least about 95%, 96%, 97%, more typically at least about 98%, or most typically at least about 99% amino acid identity) that retain biological activity. Polypeptides encoded by allelic variants may have a similar, increased, or decreased activity compared to polypeptides comprising SEQ ID NO: 8052-16102.

Fragments of the proteins of the present invention which are capable of exhibiting biological activity are also encompassed by the present invention. Fragments of the protein may be in linear form or they may be cyclized using known methods, for example, as described in H. U. Saragovi, et al., Bio/Technology 10, 773-778 (1992) and in R. S. McDowell, et al., J. Amer. Chem. Soc. 114, 9245-9253 (1992), both of which are incorporated herein by reference. Such fragments may be fused to carrier molecules such as immunoglobulins for many purposes, including increasing the valency of protein binding sites.

The present invention also provides both full-length and mature forms (for example, without a signal sequence or precursor sequence) of the disclosed proteins. The protein coding sequence is identified in the sequence listing by translation of the disclosed nucleotide sequences. The mature form of such protein may be obtained by expression of a full-length polynucleotide in a suitable mammalian cell or other host cell. The sequence of the mature form of the protein is also determinable from the amino acid sequence of the full-length form. Where proteins of the present invention are membrane bound, soluble forms of the proteins are also provided. In such forms, part or all of the regions causing the proteins to be membrane bound are deleted so that the proteins are fully secreted from the cell in which they are expressed.

Protein compositions of the present invention may further comprise an acceptable carrier, such as a hydrophilic, *e.g.*, pharmaceutically acceptable, carrier.

The present invention further provides isolated polypeptides encoded by the nucleic aeid fragments of the present invention or by degenerate variants of the nucleic acid fragments of the present invention. By "degenerate variant" is intended nucleotide fragments which differ from a nucleic acid fragment of the present invention (*e.g.*, an ORF) by nucleotide sequence but, due to the degeneracy of the genetic code, encode an identical polypeptide sequence. Preferred nucleic acid fragments of the present invention are the ORFs that encode proteins.

A variety of methodologies known in the art can be utilized to obtain any one of the isolated polypeptides or proteins of the present invention. At the simplest level, the amino acid sequence can be synthesized using commercially available peptide synthesizers. The synthetically-constructed protein sequences, by virtue of sharing primary, secondary or tertiary structural and/or conformational characteristics with proteins may possess biological properties in common therewith, including protein activity. This technique is particularly useful in producing small peptides and fragments of larger polypeptides. Fragments are useful, for example, in generating antibodies against the native polypeptide. Thus, they may be employed as biologically active or immunological substitutes for natural, purified proteins in screening of therapeutic compounds and in immunological processes for the development of antibodies.

The polypeptides and proteins of the present invention can alternatively be purified from cells which have been altered to express the desired polypeptide or protein. As used herein, a cell is said to be altered to express a desired polypeptide or protein when the cell, through genetic manipulation, is made to produce a polypeptide or protein which it normally does not produce or which the cell normally produces at a lower level. One skilled in the art can readily adapt procedures for introducing and expressing either recombinant or synthetic sequences into eukaryotic or prokaryotic cells in order to generate a cell which produces one of the polypeptides or proteins of the present invention.

The invention also relates to methods for producing a polypeptide comprising growing a culture of host cells of the invention in a suitable culture medium, and purifying the protein from the cells or the culture in which the cells are grown. For example, the methods of the invention include a process for producing a polypeptide in which a host cell containing a suitable expression vector that includes a polynucleotide of the invention is cultured under conditions that allow expression of the encoded polypeptide. The polypeptide can be recovered from the culture, conveniently from the culture medium, or from a lysate prepared from the host cells and further purified. Preferred embodiments include those in which the protein produced by such process is a full length or mature form of the protein.

In an alternative method, the polypeptide or protein is purified from bacterial cells which naturally produce the polypeptide or protein. One skilled in the art can readily follow known methods for isolating polypeptides and proteins in order to obtain one of the isolated polypeptides or proteins of the present invention. These include, but are not limited to, immunochromatography, HPLC, size-exclusion chromatography, ion-exchange chromatography, and immuno-affinity chromatography. See, *e.g.*, Scopes, *Protein Purification: Principles and Practice*, Springer-Verlag (1994); Sambrook, et al., in Molecular Cloning: *A Laboratory Manual*; Ausubel et al., *Current Protocols in Molecular Biology*. Polypeptide fragments that

retain biological/immunological activity include fragments comprising greater than about 100 amino acids, or greater than about 200 amino acids, and fragments that encode specific protein domains.

The purified polypeptides can be used in *in vitro* binding assays which are well known in the art to identify molecules which bind to the polypeptides. These molecules include but are not limited to, for *e.g.*, small molecules, molecules from combinatorial libraries, antibodies or other proteins. The molecules identified in the binding assay are then tested for antagonist or agonist activity in *in vivo* tissue culture or animal models that are well known in the art. In brief, the molecules are titrated into a plurality of cell cultures or animals and then tested for either cell/animal death or prolonged survival of the animal/cells.

In addition, the peptides of the invention or molecules capable of binding to the peptides may be complexed with toxins, *e.g.*, ricin or cholera, or with other compounds that are toxic to cells. The toxin-binding molecule complex is then targeted to a tumor or other cell by the specificity of the binding molecule for SEQ ID NO: 8052-16102.

The protein of the invention may also be expressed as a product of transgenic animals, *e.g.*, as a component of the milk of transgenic cows, goats, pigs, or sheep which are characterized by somatic or germ cells containing a nucleotide sequence encoding the protein.

The proteins provided herein also include proteins characterized by amino acid sequences similar to those of purified proteins but into which modification are naturally provided or deliberately engineered. For example, modifications in the peptide or DNA sequence can be made by those skilled in the art using known techniques. Modifications of interest in the protein sequences may include the alteration, substitution, replacement, insertion or deletion of a selected amino acid residue in the coding sequence. For example, one or more of the cysteine residues may be deleted or replaced with another amino acid to alter the conformation of the molecule. Techniques for such alteration, substitution, replacement, insertion or deletion are well known to those skilled in the art (see, *e.g.*, U.S. Pat. No. 4,518,584). Preferably, such alteration, substitution, replacement, insertion or deletion retains the desired activity of the protein. Regions of the protein that are important for the protein function can be determined by various methods known in the art including the alanine-scanning method which involved systematic substitution of single or strings of amino acids with alanine, followed by testing the resulting alanine-containing variant for biological activity. This type of analysis determines the importance of the substituted amino acid(s) in biological activity. Regions of the protein that are important for protein function may be determined by the eMATRIX program.

Other fragments and derivatives of the sequences of proteins which would be expected to retain protein activity in whole or in part and are useful for screening or other immunological

methodologies may also be easily made by those skilled in the art given the disclosures herein. Such modifications are encompassed by the present invention.

The protein may also be produced by operably linking the isolated polynucleotide of the invention to suitable control sequences in one or more insect expression vectors, and employing an insect expression system. Materials and methods for baculovirus/insect cell expression systems are commercially available in kit form from, *e.g.*, Invitrogen, San Diego, Calif., U.S.A. (the MaxBat™ kit), and such methods are well known in the art, as described in Summers and Smith, Texas Agricultural Experiment Station Bulletin No. 1555 (1987), incorporated herein by reference. As used herein, an insect cell capable of expressing a polynucleotide of the present invention is "transformed."

The protein of the invention may be prepared by culturing transformed host cells under culture conditions suitable to express the recombinant protein. The resulting expressed protein may then be purified from such culture (*i.e.*, from culture medium or cell extracts) using known purification processes, such as gel filtration and ion exchange chromatography. The purification of the protein may also include an affinity column containing agents which will bind to the protein; one or more column steps over such affinity resins as concanavalin A-agarose, heparin-toyopearl™ or Cibacrom blue 3GA Sepharose™; one or more steps involving hydrophobic interaction chromatography using such resins as phenyl ether, butyl ether, or propyl ether; or immunoaffinity chromatography.

Alternatively, the protein of the invention may also be expressed in a form that will facilitate purification. For example, it may be expressed as a fusion protein, such as those of maltose binding protein (MBP), glutathione-S-transferase (GST) or thioredoxin (TRX), or as a His-tag. Kits for expression and purification of such fusion proteins are commercially available from New England BioLab (Beverly, Mass.), Pharmacia (Piscataway, N.J.) and Invitrogen, respectively. The protein can also be tagged with an epitope and subsequently purified by using a specific antibody directed to such epitope. One such epitope ("FLAG®") is commercially available from Kodak (New Haven, Conn.).

Finally, one or more reverse-phase high performance liquid chromatography (RP- HPLC) steps employing hydrophobic RP-HPLC media, *e.g.*, silica gel having pendant methyl or other aliphatic groups, can be employed to further purify the protein. Some or all of the foregoing purification steps, in various combinations, can also be employed to provide a substantially homogeneous isolated recombinant protein. The protein thus purified is substantially free of other mammalian proteins and is defined in accordance with the present invention as an "isolated protein."

The polypeptides of the invention include analogs (variants). This embraces fragments, as well as peptides in which one or more amino acids has been deleted, inserted, or substituted. Also, analogs of the polypeptides of the invention embrace fusions of the polypeptides or modifications of the polypeptides of the invention, wherein the polypeptide or analog is fused to another moiety or moieties, *e.g.*, targeting moiety or another therapeutic agent. Such analogs may exhibit improved properties such as activity and/or stability. Examples of moieties which may be fused to the polypeptide or an analog include, for example, targeting moieties which provide for the delivery of polypeptide to pancreatic cells, *e.g.*, antibodies to pancreatic cells, antibodies to immune cells such as T-cells, monocytes, dendritic.cells, granulocytes, etc., as well as receptor and ligands expressed on pancreatic or immune cells. Other moieties which may be fused to the polypeptide include therapeutic agents which are used for treatment, for example, immunosuppressive drugs such as cyclosporin, SK506, azathioprine, CD3 antibodies and steroids. Also, polypeptides may be fused to immune modulators, and other cytokines such as alpha or beta interferon.

4.6.1 DETERMINING POLYPEPTIDE AND POLYNUCLEOTIDE IDENTITY AND SIMILARITY

Preferred identity and/or similarity are designed to give the largest match between the sequences tested. Methods to determine identity and similarity are codified in computer programs including, but are not limited to, the GCG program package, including GAP (Devereux, J., et al., Nucleic Acids Research 12(1):387 (1984); Genetics Computer Group, University of Wisconsin, Madison, WI), BLASTP, BLASTN, BLASTX, FASTA (Altschul, S.F. et al., J. Molec. Biol. 215:403-410 (1990), PSI-BLAST (Altschul S.F. et al., Nucleic Acids Res. vol. 25, pp. 3389-3402, herein incorporated by reference), eMatrix software (Wu et al., J. Comp. Biol., Vol. 6, pp. 219-235 (1999), herein incorporated by reference), eMotif software (Nevill-Manning et al, ISMB-97, Vol. 4, pp. 202-209, herein incorporated by reference), pFam software (Sonnhammer et al., Nucleic Acids Res., Vol. 26(1), pp. 320-322 (1998), herein incorporated by reference) and the Kyte-Doolittle hydrophobocity prediction algorithm (J. Mol Biol, 157, pp. 105-31 (1982), incorporated herein by reference). The BLAST programs are publicly available from the National Center for Biotechnology Information (NCBI) and other sources (BLAST Manual, Altschul, S., et al. NCB NLM NIH Bethesda, MD 20894; Altschul, S., et al., J. Mol. Biol. 215:403-410 (1990).

4.7 CHIMERIC AND FUSION PROTEINS

The invention also provides chimeric or fusion proteins. As used herein, a "chimeric protein" or "fusion protein" comprises a polypeptide of the invention operatively linked to

another polypeptide. Within a fusion protein the polypeptide according to the invention can correspond to all or a portion of a protein according to the invention. In one embodiment, a fusion protein comprises at least one biologically active portion of a protein according to the invention. In another embodiment, a fusion protein comprises at least two biologically active portions of a protein according to the invention. Within the fusion protein, the term "operatively linked" is intended to indicate that the polypeptide according to the invention and the other polypeptide are fused in-frame to each other. The polypeptide can be fused to the N-terminus or C-terminus.

For example, in one embodiment a fusion protein comprises a polypeptide according to the invention operably linked to the extracellular domain of a second protein.

In another embodiment, the fusion protein is a GST-fusion protein in which the polypeptide sequences of the invention are fused to the C-terminus of the GST (*i.e.*, glutathione S-transferase) sequences.

In another embodiment, the fusion protein is an immunoglobulin fusion protein in which the polypeptide sequences according to the invention comprises one or more domains are fused to sequences derived from a member of the immunoglobulin protein family. The immunoglobulin fusion proteins of the invention can be incorporated into pharmaceutical compositions and administered to a subject to inhibit an interaction between a ligand and a protein of the invention on the surface of a cell, to thereby suppress signal transduction *in vivo*. The immunoglobulin fusion proteins can be used to affect the bioavailability of a cognate ligand. Inhibition of the ligand/protein interaction may be useful therapeutically for both the treatment of proliferative and differentiative disorders, *e,g.,* cancer as well as modulating (*e.g.*, promoting or inhibiting) cell survival. Moreover, the immunoglobulin fusion proteins of the invention can be used as immunogens to produce antibodies in a subject, to purify ligands, and in screening assays to identify molecules that inhibit the interaction of a polypeptide of the invention with a ligand.

A chimeric or fusion protein of the invention can be produced by standard recombinant DNA techniques. For example, DNA fragments coding for the different polypeptide sequences are ligated together in-frame in accordance with conventional techniques, *e.g.*, by employing blunt-ended or stagger-ended termini for ligation, restriction enzyme digestion to provide for appropriate termini, filling-in of cohesive ends as appropriate, alkaline phosphatase treatment to avoid undesirable joining, and enzymatic ligation. In another embodiment, the fusion gene can be synthesized by conventional techniques including automated DNA synthesizers. Alternatively, PCR amplification of gene fragments can be carried out using anchor primers that give rise to complementary overhangs between two consecutive gene fragments that can subsequently be annealed and reamplified to generate a chimeric gene sequence (see, for

example, Ausubel et al. (eds.) CURRENT PROTOCOLS IN MOLECULAR BIOLOGY, John Wiley & Sons, 1992). Moreover, many expression vectors are commercially available that already encode a fusion moiety (*e.g.*, a GST polypeptide). A nucleic acid encoding a polypeptide of the invention can be cloned into such an expression vector such that the fusion moiety is linked in-frame to the protein of the invention.

4.8 GENE THERAPY

Mutations in the polynucleotides of the invention gene may result in loss of normal function of the encoded protein. The invention thus provides gene therapy to restore normal activity of the polypeptides of the invention; or to treat disease states involving polypeptides of the invention. Delivery of a functional gene encoding polypeptides of the invention to appropriate cells is effected *ex vivo*, *in situ*, or *in vivo* by use of vectors, and more particularly viral vectors (*e.g.*, adenovirus, adeno-associated virus, or a retrovirus), or *ex vivo* by use of physical DNA transfer methods (*e.g.*, liposomes or chemical treatments). See, for example, Anderson, Nature, supplement to vol. 392, no. 6679, pp.25-20 (1998). For additional reviews of gene therapy technology see Friedmann, Science, 244: 1275-1281 (1989); Verma, Scientific American: 68-84 (1990); and Miller, Nature, 357: 455-460 (1992). Introduction of any one of the nucleotides of the present invention or a gene encoding the polypeptides of the present invention can also be accomplished with extrachromosomal substrates (transient expression) or artificial chromosomes (stable expression). Cells may also be cultured *ex vivo* in the presence of proteins of the present invention in order to proliferate or to produce a desired effect on or activity in such cells. Treated cells can then be introduced *in vivo* for therapeutic purposes. Alternatively, it is contemplated that in other human disease states, preventing the expression of or inhibiting the activity of polypeptides of the invention will be useful in treating the disease states. It is contemplated that antisense therapy or gene therapy could be applied to negatively regulate the expression of polypeptides of the invention.

Other methods inhibiting expression of a protein include the introduction of antisense molecules to the nucleic acids of the present invention, their complements, or their translated RNA sequences, by methods known in the art. Further, the polypeptides of the present invention can be inhibited by using targeted deletion methods, or the insertion of a negative regulatory element such as a silencer, which is tissue specific.

The present invention still further provides cells genetically engineered *in vivo* to express the polynucleotides of the invention, wherein such polynucleotides are in operative association with a regulatory sequence heterologous to the host cell which drives expression of the polynucleotides in

the cell. These methods can be used to increase or decrease the expression of the polynucleotides of the present invention.

Knowledge of DNA sequences provided by the invention allows for modification of cells to permit, increase, or decrease, expression of endogenous polypeptide. Cells can be modified (*e.g.*, by homologous recombination) to provide increased polypeptide expression by replacing, in whole or in part, the naturally occurring promoter with all or part of a heterologous promoter so that the cells express the protein at higher levels. The heterologous promoter is inserted in such a manner that it is operatively linked to the desired protein encoding sequences. See, for example, PCT International Publication No. WO 94/12650, PCT International Publication No. WO 92/20808, and PCT International Publication No. WO 91/09955. It is also contemplated that, in addition to heterologous promoter DNA, amplifiable marker DNA (*e.g.*, ada, dhfr, and the multifunctional CAD gene which encodes carbamyl phosphate synthase, aspartate transcarbamylase, and dihydroorotase) and/or intron DNA may be inserted along with the heterologous promoter DNA. If linked to the desired protein coding sequence, amplification of the marker DNA by standard selection methods results in co-amplification of the desired protein coding sequences in the cells.

In another embodiment of the present invention, cells and tissues may be engineered to express an endogenous gene comprising the polynucleotides of the invention under the control of inducible regulatory elements, in which case the regulatory sequences of the endogenous gene may be replaced by homologous recombination. As described herein, gene targeting can be used to replace a gene's existing regulatory region with a regulatory sequence isolated from a different gene or a novel regulatory sequence synthesized by genetic engineering methods. Such regulatory sequences may be comprised of promoters, enhancers, scaffold-attachment regions, negative regulatory elements, transcriptional initiation sites, regulatory protein binding sites or combinations of said sequences. Alternatively, sequences which affect the structure or stability of the RNA or protein produced may be replaced, removed, added, or otherwise modified by targeting. These sequences include polyadenylation signals, mRNA stability elements, splice sites, leader sequences for enhancing or modifying transport or secretion properties of the protein, or other sequences which alter or improve the function or stability of protein or RNA molecules.

The targeting event may be a simple insertion of the regulatory sequence, placing the gene under the control of the new regulatory sequence, *e.g.*, inserting a new promoter or enhancer or both upstream of a gene. Alternatively, the targeting event may be a simple deletion of a regulatory element, such as the deletion of a tissue-specific negative regulatory element. Alternatively, the targeting event may replace an existing element; for example, a tissue-specific enhancer can be replaced by an enhancer that has broader or different cell-type specificity than the naturally occurring elements. Here, the naturally occurring sequences are deleted and new sequences are

added. In all cases, the identification of the targeting event may be facilitated by the use of one or more selectable marker genes that are contiguous with the targeting DNA, allowing for the selection of cells in which the exogenous DNA has integrated into the cell genome. The identification of the targeting event may also be facilitated by the use of one or more marker genes exhibiting the property of negative selection, such that the negatively selectable marker is linked to the exogenous DNA, but configured such that the negatively selectable marker flanks the targeting sequence, and such that a correct homologous recombination event with sequences in the host cell genome does not result in the stable integration of the negatively selectable marker. Markers useful for this purpose include the Herpes Simplex Virus thymidine kinase (TK) gene or the bacterial xanthine-guanine phosphoribosyl-transferase (gpt) gene.

The gene targeting or gene activation techniques which can be used in accordance with this aspect of the invention are more particularly described in U.S. Patent No. 5,272,071 to Chappel; U.S. Patent No. 5,578,461 to Sherwin et al.; International Application No. PCT/US92/09627 (WO93/09222) by Selden et al.; and International Application No. PCT/US90/06436 (WO91/06667) by Skoultchi et al., each of which is incorporated by reference herein in its entirety.

4.9 TRANSGENIC ANIMALS

In preferred methods to determine biological functions of the polypeptides of the invention in vivo, one or more genes provided by the invention are either over expressed or inactivated in the germ line of animals using homologous recombination [Capecchi, Science 244:1288-1292 (1989)]. Animals in which the gene is over expressed, under the regulatory control of exogenous or endogenous promoter elements, are known as transgenic animals. Animals in which an endogenous gene has been inactivated by homologous recombination are referred to as "knockout" animals. Knockout animals, preferably non-human mammals, can be prepared as described in U.S. Patent No. 5,557,032, incorporated herein by reference. Transgenic animals are useful to determine the roles polypeptides of the invention play in biological processes, and preferably in disease states. Transgenic animals are useful as model systems to identify compounds that modulate lipid metabolism. Transgenic animals, preferably non-human mammals, are produced using methods as described in U.S. Patent No 5,489,743 and PCT Publication No. WO94/28122, incorporated herein by reference.

Transgenic animals can be prepared wherein all or part of a promoter of the polynucleotides of the invention is either activated or inactivated to alter the level of expression of the polypeptides of the invention. Inactivation can be carried out using homologous recombination methods described above. Activation can be achieved by supplementing or even replacing the homologous promoter to provide for increased protein expression. The

homologous promoter can be supplemented by insertion of one or more heterologous enhancer elements known to confer promoter activation in a particular tissue.

The polynucleotides of the present invention also make possible the development, through, *e.g.*, homologous recombination or knock out strategies, of animals that fail to express polypeptides of the invention or that express a variant polypeptide. Such animals are useful as models for studying the *in vivo* activities of polypeptide as well as for studying modulators of the polypeptides of the invention.

In preferred methods to determine biological functions of the polypeptides of the invention *in vivo*, one or more genes provided by the invention are either over expressed or inactivated in the germ line of animals using homologous recombination [Capecchi, Science 244:1288-1292 (1989)]. Animals in which the gene is over expressed, under the regulatory control of exogenous or endogenous promoter elements, are known as transgenic animals. Animals in which an endogenous gene has been inactivated by homologous recombination are referred to as "knockout" animals. Knockout animals, preferably non-human mammals, can be prepared as described in U.S. Patent No. 5,557,032, incorporated herein by reference. Transgenic animals are useful to determine the roles polypeptides of the invention play in biological processes, and preferably in disease states. Transgenic animals are useful as model systems to identify compounds that modulate lipid metabolism. Transgenic animals, preferably non-human mammals, are produced using methods as described in U.S. Patent No 5,489,743 and PCT Publication No. WO94/28122, incorporated herein by reference.

Transgenic animals can be prepared wherein all or part of the polynucleotides of the invention promoter is either activated or inactivated to alter the level of expression of the polypeptides of the invention. Inactivation can be carried out using homologous recombination methods described above. Activation can be achieved by supplementing or even replacing the homologous promoter to provide for increased protein expression. The homologous promoter can be supplemented by insertion of one or more heterologous enhancer elements known to confer promoter activation in a particular tissue.

4.10 USES AND BIOLOGICAL ACTIVITY

The polynucleotides and proteins of the present invention are expected to exhibit one or more of the uses or biological activities (including those associated with assays cited herein) identified herein. Uses or activities described for proteins of the present invention may be provided by administration or use of such proteins or of polynucleotides encoding such proteins (such as, for example, in gene therapies or vectors suitable for introduction of DNA). The mechanism underlying the particular condition or pathology will dictate whether the

polypeptides of the invention, the polynucleotides of the invention or modulators (activators or inhibitors) thereof would be beneficial to the subject in need of treatment. Thus, "therapeutic compositions of the invention" include compositions comprising isolated polynucleotides (including recombinant DNA molecules, cloned genes and degenerate variants thereof) or polypeptides of the invention (including full length protein, mature protein and truncations or domains thereof), or compounds and other substances that modulate the overall activity of the target gene products, either at the level of target gene/protein expression or target protein activity. Such modulators include polypeptides, analogs, (variants), including fragments and fusion proteins, antibodies and other binding proteins; chemical compounds that directly or indirectly activate or inhibit the polypeptides of the invention (identified, *e.g.*, via drug screening assays as described herein); antisense polynucleotides and polynucleotides suitable for triple helix formation; and in particular antibodies or other binding partners that specifically recognize one or more epitopes of the polypeptides of the invention.

The polypeptides of the present invention may likewise be involved in cellular activation or in one of the other physiological pathways described herein.

4.10.1 RESEARCH USES AND UTILITIES

The polynucleotides provided by the present invention can be used by the research community for various purposes. The polynucleotides can be used to express recombinant protein for analysis, characterization or therapeutic use; as markers for tissues in which the corresponding protein is preferentially expressed (either constitutively or at a particular stage of tissue differentiation or development or in disease states); as molecular weight markers on gels; as chromosome markers or tags (when labeled) to identify chromosomes or to map related gene positions; to compare with endogenous DNA sequences in patients to identify potential genetic disorders; as probes to hybridize and thus discover novel, related DNA sequences; as a source of information to derive PCR primers for genetic fingerprinting; as a probe to "subtract-out" known sequences in the process of discovering other novel polynucleotides; for selecting and making oligomers for attachment to a "gene chip" or other support, including for examination of expression patterns; to raise anti-protein antibodies using DNA immunization techniques; and as an antigen to raise anti-DNA antibodies or elicit another immune response. Where the polynucleotide encodes a protein which binds or potentially binds to another protein (such as, for example, in a receptor-ligand interaction), the polynucleotide can also be used in interaction trap assays (such as, for example, that described in Gyuris et al., Cell 75:791-803 (1993)) to identify polynucleotides encoding the other protein with which binding occurs or to identify inhibitors of the binding interaction.

The polypeptides provided by the present invention can similarly be used in assays to determine biological activity, including in a panel of multiple proteins for high-throughput screening; to raise antibodies or to elicit another immune response; as a reagent (including the labeled reagent) in assays designed to quantitatively determine levels of the protein (or its receptor) in biological fluids; as markers for tissues in which the corresponding polypeptide is preferentially expressed (either constitutively or at a particular stage of tissue differentiation or development or in a disease state); and, of course, to isolate correlative receptors or ligands. Proteins involved in these binding interactions can also be used to screen for peptide or small molecule inhibitors or agonists of the binding interaction.

Any or all of these research utilities are capable of being developed into reagent grade or kit format for commercialization as research products.

Methods for performing the uses listed above are well known to those skilled in the art. References disclosing such methods include without limitation "Molecular Cloning: A Laboratory Manual", 2d ed., Cold Spring Harbor Laboratory Press, Sambrook, J., E. F. Fritsch and T. Maniatis eds., 1989, and "Methods in Enzymology: Guide to Molecular Cloning Techniques", Academic Press, Berger, S. L. and A. R. Kimmel eds., 1987.

4.10.2 NUTRITIONAL USES

Polynucleotides and polypeptides of the present invention can also be used as nutritional sources or supplements. Such uses include without limitation use as a protein or amino acid supplement, use as a carbon source, use as a nitrogen source and use as a source of carbohydrate. In such cases the polypeptide or polynucleotide of the invention can be added to the feed of a particular organism or can be administered as a separate solid or liquid preparation, such as in the form of powder, pills, solutions, suspensions or capsules. In the case of microorganisms, the polypeptide or polynucleotide of the invention can be added to the medium in or on which the microorganism is cultured.

4.10.3 CYTOKINE AND CELL PROLIFERATION/DIFFERENTIATION ACTIVITY

A polypeptide of the present invention may exhibit activity relating to cytokine, cell proliferation (either inducing or inhibiting) or cell differentiation (either inducing or inhibiting) activity or may induce production of other cytokines in certain cell populations. A polynucleotide of the invention can encode a polypeptide exhibiting such attributes. Many protein factors discovered to date, including all known cytokines, have exhibited activity in one or more factor-dependent cell proliferation assays, and hence the assays serve as a convenient

confirmation of cytokine activity. The activity of therapeutic compositions of the present invention is evidenced by any one of a number of routine factor dependent cell proliferation assays for cell lines including, without limitation, 32D, DA2, DA1G, T10, B9, B9/11, BaF3, MC9/G, M+(preB M+), 2E8, RB5, DA1, 123, T1165, HT2, CTLL2, TF-1, Mo7e, CMK, HUVEC, and Caco. Therapeutic compositions of the invention can be used in the following:

Assays for T-cell or thymocyte proliferation include without limitation those described in: Current Protocols in Immunology, Ed by J. E. Coligan, A. M. Kruisbeek, D. H. Margulies, E. M. Shevach, W. Strober, Pub. Greene Publishing Associates and Wiley-Interscience (Chapter 3, *In Vitro* assays for Mouse Lymphocyte Function 3.1-3.19; Chapter 7, Immunologic studies in Humans); Takai et al., J. Immunol. 137:3494-3500, 1986; Bertagnolli et al., J. Immunol. 145:1706-1712, 1990; Bertagnolli et al., Cellular Immunology 133:327-341, 1991; Bertagnolli, et al., I. Immunol. 149:3778-3783, 1992; Bowman et al., I. Immunol. 152:1756-1761, 1994.

Assays for cytokine production and/or proliferation of spleen cells, lymph node cells or thymocytes include, without limitation, those described in: Polyclonal T cell stimulation, Kruisbeek, A. M. and Shevach, E. M. In Current Protocols in Immunology. J. E. e.a. Coligan eds. Vol 1 pp. 3.12.1-3.12.14, John Wiley and Sons, Toronto. 1994; and Measurement of mouse and human interleukin-γ, Schreiber, R. D. In Current Protocols in Immunology. J. E. e.a. Coligan eds. Vol 1 pp. 6.8.1-6.8.8, John Wiley and Sons, Toronto. 1994.

Assays for proliferation and differentiation of hematopoietic and lymphopoietic cells include, without limitation, those described in: Measurement of Human and Murine Interleukin 2 and Interleukin 4, Bottomly, K., Davis, L. S. and Lipsky, P. E. In Current Protocols in Immunology. J. E. e.a. Coligan eds. Vol 1 pp. 6.3.1-6.3.12, John Wiley and Sons, Toronto. 1991; deVries et al., J. Exp. Med. 173:1205-1211, 1991; Moreau et al., Nature 336:690-692, 1988; Greenberger et al., Proc. Natl. Acad. Sci. U.S.A. 80:2931-2938, 1983; Measurement of mouse and human interleukin 6--Nordan, R. In Current Protocols in Immunology. J. E. Coligan eds. Vol 1 pp. 6.6.1-6.6.5, John Wiley and Sons, Toronto. 1991; Smith et al., Proc. Natl. Aced. Sci. U.S.A. 83:1857-1861, 1986; Measurement of human Interleukin 11--Bennett, F., Giannotti, J., Clark, S. C. and Turner, K. J. In Current Protocols in Immunology. J. E. Coligan eds. Vol 1 pp. 6.15.1 John Wiley and Sons, Toronto. 1991; Measurement of mouse and human Interleukin 9--Ciarletta, A., Giannotti, J., Clark, S. C. and Turner, K. J. In Current Protocols in Immunology. J. E. Coligan eds. Vol 1 pp. 6.13.1, John Wiley and Sons, Toronto. 1991.

Assays for T-cell clone responses to antigens (which will identify, among others, proteins that affect APC-T cell interactions as well as direct T-cell effects by measuring proliferation and cytokine production) include, without limitation, those described in: Current Protocols in Immunology, Ed by J. E. Coligan, A. M. Kruisbeek, D. H. Margulies, E. M. Shevach, W Strober,

Pub. Greene Publishing Associates and Wiley-Interscience (Chapter 3, *In Vitro* assays for Mouse Lymphocyte Function; Chapter 6, Cytokines and their cellular receptors; Chapter 7, Immunologic studies in Humans); Weinberger et al., Proc. Natl. Acad. Sci. USA 77:6091-6095, 1980; Weinberger et al., Eur. J. Immun. 11:405-411, 1981; Takai et al., J. Immunol. 137:3494-3500, 1986; Takai et al., J. Immunol. 140:508-512, 1988.

4.10.4 STEM CELL GROWTH FACTOR ACTIVITY

A polypeptide of the present invention may exhibit stem cell growth factor activity and be involved in the proliferation, differentiation and survival of pluripotent and totipotent stem cells including primordial germ cells, embryonic stem cells, hematopoietic stem cells and/or germ line stem cells. Administration of the polypeptide of the invention to stem cells *in vivo* or *ex vivo* is expected to maintain and expand cell populations in a totipotential or pluripotential state which would be useful for re-engineering damaged or diseased tissues, transplantation, manufacture of bio-pharmaceuticals and the development of bio-sensors. The ability to produce large quantities of human cells has important working applications for the production of human proteins which currently must be obtained from non-human sources or donors, implantation of cells to treat diseases such as Parkinson's, Alzheimer's and other neurodegenerative diseases; tissues for grafting such as bone marrow, skin, cartilage, tendons, bone, muscle (including cardiac muscle), blood vessels, cornea, neural cells, gastrointestinal cells and others; and organs for transplantation such as kidney, liver, pancreas (including islet cells), heart and lung.

It is contemplated that multiple different exogenous growth factors and/or cytokines may be administered in combination with the polypeptide of the invention to achieve the desired effect, including any of the growth factors listed herein, other stem cell maintenance factors, and specifically including stem cell factor (SCF), leukemia inhibitory factor (LIF), Flt-3 ligand (Flt-3L), any of the interleukins, recombinant soluble IL-6 receptor fused to IL-6, macrophage inflammatory protein 1-alpha (MIP-1-alpha), G-CSF, GM-CSF, thrombopoietin (TPO), platelet factor 4 (PF-4), platelet-derived growth factor (PDGF), neural growth factors and basic fibroblast growth factor (bFGF).

Since totipotent stem cells can give rise to virtually any mature cell type, expansion of these cells in culture will facilitate the production of large quantities of mature cells. Techniques for culturing stem cells are known in the art and administration of polypeptides of the invention, optionally with other growth factors and/or cytokines, is expected to enhance the survival and proliferation of the stem cell populations. This can be accomplished by direct administration of the polypeptide of the invention to the culture medium. Alternatively, stroma cells transfected with a polynucleotide that encodes for the polypeptide of the invention can be used as a feeder

layer for the stem cell populations in culture or in vivo. Stromal support cells for feeder layers may include embryonic bone marrow fibroblasts, bone marrow stromal cells, fetal liver cells, or cultured embryonic fibroblasts (see U.S. Patent No. 5,690,926).

Stem cells themselves can be transfected with a polynucleotide of the invention to induce autocrine expression of the polypeptide of the invention. This will allow for generation of undifferentiated totipotential/pluripotential stem cell lines that are useful as is or that can then be differentiated into the desired mature cell types. These stable cell lines can also serve as a source of undifferentiated totipotential/pluripotential mRNA to create cDNA libraries and templates for polymerase chain reaction experiments. These studies would allow for the isolation and identification of differentially expressed genes in stem cell populations that regulate stem cell proliferation and/or maintenance.

Expansion and maintenance of totipotent stem cell populations will be useful in the treatment of many pathological conditions. For example, polypeptides of the present invention may be used to manipulate stem cells in culture to give rise to neuroepithelial cells that can be used to augment or replace cells damaged by illness, autoimmune disease, accidental damage or genetic disorders. The polypeptide of the invention may be useful for inducing the proliferation of neural cells and for the regeneration of nerve and brain tissue, *i.e.* for the treatment of central and peripheral nervous system diseases and neuropathies, as well as mechanical and traumatic disorders which involve degeneration, death or trauma to neural cells or nerve tissue. In addition, the expanded stem cell populations can also be genetically altered for gene therapy purposes and to decrease host rejection of replacement tissues after grafting or implantation.

Expression of the polypeptide of the invention and its effect on stem cells can also be manipulated to achieve controlled differentiation of the stem cells into more differentiated cell types. A broadly applicable method of obtaining pure populations of a specific differentiated cell type from undifferentiated stem cell populations involves the use of a cell-type specific promoter driving a selectable marker. The selectable marker allows only cells of the desired type to survive. For example, stem cells can be induced to differentiate into cardiomyocytes (Wobus et al., Differentiation, 48: 173-182, (1991); Klug et al., J. Clin. Invest., 98(1): 216-224, (1998)) or skeletal muscle cells (Browder, L. W. In: *Principles of Tissue Engineering eds.* Lanza et al., Academic Press (1997)). Alternatively, directed differentiation of stem cells can be accomplished by culturing the stem cells in the presence of a differentiation factor such as retinoic acid and an antagonist of the polypeptide of the invention which would inhibit the effects of endogenous stem cell factor activity and allow differentiation to proceed.

In vitro cultures of stem cells can be used to determine if the polypeptide of the invention exhibits stem cell growth factor activity. Stem cells are isolated from any one of various cell

sources (including hematopoietic stem cells and embryonic stem cells) and cultured on a feeder layer, as described by Thompson et al. Proc. Natl. Acad. Sci, U.S.A., 92: 7844-7848 (1995), in the presence of the polypeptide of the invention alone or in combination with other growth factors or cytokines. The ability of the polypeptide of the invention to induce stem cells proliferation is determined by colony formation on semi-solid support *e.g.* as described by Bernstein et al., Blood, 77: 2316-2321 (1991).

4.10.5 HEMATOPOIESIS REGULATING ACTIVITY

A polypeptide of the present invention may be involved in regulation of hematopoiesis and, consequently, in the treatment of myeloid or lymphoid cell disorders. Even marginal biological activity in support of colony forming cells or of factor-dependent cell lines indicates involvement in regulating hematopoiesis, *e.g.* in supporting the growth and proliferation of erythroid progenitor cells alone or in combination with other cytokines, thereby indicating utility, for example, in treating various anemias or for use in conjunction with irradiation/chemotherapy to stimulate the production of erythroid precursors and/or erythroid cells; in supporting the growth and proliferation of myeloid cells such as granulocytes and monocytes/macrophages (*i.e.*, traditional CSF activity) useful, for example, in conjunction with chemotherapy to prevent or treat consequent myelo-suppression; in supporting the growth and proliferation of megakaryocytes and consequently of platelets thereby allowing prevention or treatment of various platelet disorders such as thrombocytopenia, and generally for use in place of or complimentary to platelet transfusions; and/or in supporting the growth and proliferation of hematopoietic stem cells which are capable of maturing to any and all of the above-mentioned hematopoietic cells and therefore find therapeutic utility in various stem cell disorders (such as those usually treated with transplantation, including, without limitation, aplastic anemia and paroxysmal nocturnal hemoglobinuria), as well as in repopulating the stem cell compartment post irradiation/chemotherapy, either *in-vivo* or *ex-vivo* (*i.e.*, in conjunction with bone marrow transplantation or with peripheral progenitor cell transplantation (homologous or heterologous)) as normal cells or genetically manipulated for gene therapy.

Therapeutic compositions of the invention can be used in the following:

Suitable assays for proliferation and differentiation of various hematopoietic lines are cited above.

Assays for embryonic stem cell differentiation (which will identify, among others, proteins that influence embryonic differentiation hematopoiesis) include, without limitation, those described in: Johansson et al. Cellular Biology 15:141-151, 1995; Keller et al., Molecular and Cellular Biology 13:473-486, 1993; McClanahan et al., Blood 81:2903-2915, 1993.

Assays for stem cell survival and differentiation (which will identify, among others, proteins that regulate lympho-hematopoiesis) include, without limitation, those described in: Methylcellulose colony forming assays, Freshney, M. G. In Culture of Hematopoietic Cells. R. I. Freshney, et al. eds. Vol pp. 265-268, Wiley-Liss, Inc., New York, N.Y. 1994; Hirayama et al., Proc. Natl. Acad. Sci. USA 89:5907-5911, 1992; Primitive hematopoietic colony forming cells with high proliferative potential, McNiece, I. K. and Briddell, R. A. In Culture of Hematopoietic Cells. R. I. Freshney, et al. eds. Vol pp. 23-39, Wiley-Liss, Inc., New York, N.Y. 1994; Neben et al., Experimental Hematology 22:353-359, 1994; Cobblestone area forming cell assay, Ploemacher, R. E. In Culture of Hematopoietic Cells. R. I. Freshney, et al. eds. Vol pp. 1-21, Wiley-Liss, Inc., New York, N.Y. 1994; Long term bone marrow cultures in the presence of stromal cells, Spooncer, E., Dexter, M. and Allen, T. In Culture of Hematopoietic Cells. R. I. Freshney, et al. eds. Vol pp. 163-179, Wiley-Liss, Inc., New York, N.Y. 1994; Long term culture initiating cell assay, Sutherland, H. J. In Culture of Hematopoietic Cells. R. I. Freshney, et al. eds. Vol pp. 139-162, Wiley-Liss, Inc., New York, N.Y. 1994.

4.10.6 TISSUE GROWTH ACTIVITY

A polypeptide of the present invention also may be involved in bone, cartilage, tendon, ligament and/or nerve tissue growth or regeneration, as well as in wound healing and tissue repair and replacement, and in healing of burns, incisions and ulcers.

A polypeptide of the present invention which induces cartilage and/or bone growth in circumstances where bone is not normally formed, has application in the healing of bone fractures and cartilage damage or defects in humans and other animals. Compositions of a polypeptide, antibody, binding partner, or other modulator of the invention may have prophylactic use in closed as well as open fracture reduction and also in the improved fixation of artificial joints. De novo bone formation induced by an osteogenic agent contributes to the repair of congenital, trauma induced, or oncologic resection induced craniofacial defects, and also is useful in cosmetic plastic surgery.

A polypeptide of this invention may also be involved in attracting bone-forming cells, stimulating growth of bone-forming cells, or inducing differentiation of progenitors of bone-forming cells. Treatment of osteoporosis, osteoarthritis, bone degenerative disorders, or periodontal disease, such as through stimulation of bone and/or cartilage repair or by blocking inflammation or processes of tissue destruction (collagenase activity, osteoclast activity, etc.) mediated by inflammatory processes may also be possible using the composition of the invention.

Another category of tissue regeneration activity that may involve the polypeptide of the present invention is tendon/ligament formation. Induction of tendon/ligament-like tissue or other tissue formation in circumstances where such tissue is not normally formed, has application in the healing of tendon or ligament tears, deformities and other tendon or ligament defects in humans and other animals. Such a preparation employing a tendon/ligament-like tissue inducing protein may have prophylactic use in preventing damage to tendon or ligament tissue, as well as use in the improved fixation of tendon or ligament to bone or other tissues, and in repairing defects to tendon or ligament tissue. De novo tendon/ligament-like tissue formation induced by a composition of the present invention contributes to the repair of congenital, trauma induced, or other tendon or ligament defects of other origin, and is also useful in cosmetic plastic surgery for attachment or repair of tendons or ligaments. The compositions of the present invention may provide environment to attract tendon- or ligament-forming cells, stimulate growth of tendon- or ligament-forming cells, induce differentiation of progenitors of tendon- or ligament-forming cells, or induce growth of tendon/ligament cells or progenitors *ex vivo* for return *in vivo* to effect tissue repair. The compositions of the invention may also be useful in the treatment of tendinitis, carpal tunnel syndrome and other tendon or ligament defects. The compositions may also include an appropriate matrix and/or sequestering agent as a carrier as is well known in the art.

The compositions of the present invention may also be useful for proliferation of neural cells and for regeneration of nerve and brain tissue, *i.e.* for the treatment of central and peripheral nervous system diseases and neuropathies, as well as mechanical and traumatic disorders, which involve degeneration, death or trauma to neural cells or nerve tissue. More specifically, a composition may be used in the treatment of diseases of the peripheral nervous system, such as peripheral nerve injuries, peripheral neuropathy and localized neuropathies, and central nervous system diseases, such as Alzheimer's, Parkinson's disease, Huntington's disease, amyotrophic lateral sclerosis, and Shy-Drager syndrome. Further conditions that may be treated in accordance with the present invention include mechanical and traumatic disorders, such as spinal cord disorders, head trauma and cerebrovascular diseases such as stroke. Peripheral neuropathies resulting from chemotherapy or other medical therapies may also be treatable using a composition of the invention.

Compositions of the invention may also be useful to promote better or faster closure of non-healing wounds, including without limitation pressure ulcers, ulcers associated with vascular insufficiency, surgical and traumatic wounds, and the like.

Compositions of the present invention may also be involved in the generation or regeneration of other tissues, such as organs (including, for example, pancreas, liver, intestine,

kidney, skin, endothelium), muscle (smooth, skeletal or cardiac) and vascular (including vascular endothelium) tissue, or for promoting the growth of cells comprising such tissues. Part of the desired effects may be by inhibition or modulation of fibrotic scarring may allow normal tissue to regenerate. A polypeptide of the present invention may also exhibit angiogenic activity.

A composition of the present invention may also be useful for gut protection or regeneration and treatment of lung or liver fibrosis, reperfusion injury in various tissues, and conditions resulting from systemic cytokine damage.

A composition of the present invention may also be useful for promoting or inhibiting differentiation of tissues described above from precursor tissues or cells; or for inhibiting the growth of tissues described above.

Therapeutic compositions of the invention can be used in the following:

Assays for tissue generation activity include, without limitation, those described in: International Patent Publication No. WO95/16035 (bone, cartilage, tendon); International Patent Publication No. WO95/05846 (nerve, neuronal); International Patent Publication No. WO91/07491 (skin, endothelium).

Assays for wound healing activity include, without limitation, those described in: Winter, Epidermal Wound Healing, pps. 71-112 (Maibach, H. I. and Rovee, D. T., eds.), Year Book Medical Publishers, Inc., Chicago, as modified by Eaglstein and Mertz, J. Invest. Dermatol 71:382-84 (1978).

4.10.7 IMMUNE STIMULATING OR SUPPRESSING ACTIVITY

A polypeptide of the present invention may also exhibit immune stimulating or immune suppressing activity, including without limitation the activities for which assays are described herein. A polynucleotide of the invention can encode a polypeptide exhibiting such activities. A protein may be useful in the treatment of various immune deficiencies and disorders (including severe combined immunodeficiency (SCID)), *e.g.*, in regulating (up or down) growth and proliferation of T and/or B lymphocytes, as well as effecting the cytolytic activity of NK cells and other cell populations. These immune deficiencies may be genetic or be caused by viral (*e.g.*, HIV) as well as bacterial or fungal infections, or may result from autoimmune disorders. More specifically, infectious diseases causes by viral, bacterial, fungal or other infection may be treatable using a protein of the present invention, including infections by HIV, hepatitis viruses, herpes viruses, mycobacteria, Leishmania spp., malaria spp. and various fungal infections such as candidiasis. Of course, in this regard, proteins of the present invention may also be useful where a boost to the immune system generally may be desirable, *i.e.*, in the treatment of cancer.

include, for example, connective tissue disease, multiple sclerosis, systemic lupus erythematosus, rheumatoid arthritis, autoimmune pulmonary inflammation, Guillain-Barre syndrome, autoimmune thyroiditis, insulin dependent diabetes mellitis, myasthenia gravis, graft-versus-host disease and autoimmune inflammatory eye disease. Such a protein (or antagonists thereof, including antibodies) of the present invention may also to be useful in the treatment of allergic reactions and conditions (*e.g.*, anaphylaxis, serum sickness, drug reactions, food allergies, insect venom allergies, mastocytosis, allergic rhinitis, hypersensitivity pneumonitis, urticaria, angioedema, eczema, atopic dermatitis, allergic contact dermatitis, erythema multiforme, Stevens-Johnson syndrome, allergic conjunctivitis, atopic keratoconjunctivitis, venereal keratoconjunctivitis, giant papillary conjunctivitis and contact allergies), such as asthma (particularly allergic asthma) or other respiratory problems. Other conditions, in which immune suppression is desired (including, for example, organ transplantation), may also be treatable using a protein (or antagonists thereof) of the present invention. The therapeutic effects of the polypeptides or antagonists thereof on allergic reactions can be evaluated by in vivo animals models such as the cumulative contact enhancement test (Lastbom et al., Toxicology 125: 59-66, 1998), skin prick test (Hoffmann et al., Allergy 54: 446-54, 1999), guinea pig skin sensitization test (Vohr et al., Arch. Toxocol. 73: 501-9), and murine local lymph node assay (Kimber et al., J. Toxicol. Environ. Health 53: 563-79).

Using the proteins of the invention it may also be possible to modulate immune responses, in a number of ways. Down regulation may be in the form of inhibiting or blocking an immune response already in progress or may involve preventing the induction of an immune response. The functions of activated T cells may be inhibited by suppressing T cell responses or by inducing specific tolerance in T cells, or both. Immunosuppression of T cell responses is generally an active, non-antigen-specific, process which requires continuous exposure of the T cells to the suppressive agent. Tolerance, which involves inducing non-responsiveness or anergy in T cells, is distinguishable from immunosuppression in that it is generally antigen-specific and persists after exposure to the tolerizing agent has ceased. Operationally, tolerance can be demonstrated by the lack of a T cell response upon reexposure to specific antigen in the absence of the tolerizing agent.

Down regulating or preventing one or more antigen functions (including without limitation B lymphocyte antigen functions (such as, for example, B7)), *e.g.*, preventing high level lymphokine synthesis by activated T cells, will be useful in situations of tissue, skin and organ transplantation and in graft-versus-host disease (GVHD). For example, blockage of T cell function should result in reduced tissue destruction in tissue transplantation. Typically, in tissue

transplants, rejection of the transplant is initiated through its recognition as foreign by T cells, followed by an immune reaction that destroys the transplant. The administration of a therapeutic composition of the invention may prevent cytokine synthesis by immune cells, such as T cells, and thus acts as an immunosuppressant. Moreover, a lack of costimulation may also be sufficient to anergize the T cells, thereby inducing tolerance in a subject. Induction of long-term tolerance by B lymphocyte antigen-blocking reagents may avoid the necessity of repeated administration of these blocking reagents. To achieve sufficient immunosuppression or tolerance in a subject, it may also be necessary to block the function of a combination of B lymphocyte antigens.

The efficacy of particular therapeutic compositions in preventing organ transplant rejection or GVHD can be assessed using animal models that are predictive of efficacy in humans. Examples of appropriate systems which can be used include allogeneic cardiac grafts in rats and xenogeneic pancreatic islet cell grafts in mice, both of which have been used to examine the immunosuppressive effects of CTLA4Ig fusion proteins in vivo as described in Lenschow et al., Science 257:789-792 (1992) and Turka et al., Proc. Natl. Acad. Sci USA, 89:11102-11105 (1992). In addition, murine models of GVHD (see Paul ed., Fundamental Immunology, Raven Press, New York, 1989, pp. 846-847) can be used to determine the effect of therapeutic compositions of the invention on the development of that disease.

Blocking antigen function may also be therapeutically useful for treating autoimmune diseases. Many autoimmune disorders are the result of inappropriate activation of T cells that are reactive against self-tissue and which promote the production of cytokines and autoantibodies involved in the pathology of the diseases. Preventing the activation of autoreactive T cells may reduce or eliminate disease symptoms. Administration of reagents which block stimulation of T cells can be used to inhibit T cell activation and prevent production of autoantibodies or T cell-derived cytokines which may be involved in the disease process. Additionally, blocking reagents may induce antigen-specific tolerance of autoreactive T cells which could lead to long-term relief from the disease. The efficacy of blocking reagents in preventing or alleviating autoimmune disorders can be determined using a number of well-characterized animal models of human autoimmune diseases. Examples include murine experimental autoimmune encephalitis, systemic lupus erythmatosis in MRL/lpr/lpr mice or NZB hybrid mice, murine autoimmune collagen arthritis, diabetes mellitus in NOD mice and BB rats, and murine experimental myasthenia gravis (see Paul ed., Fundamental Immunology, Raven Press, New York, 1989, pp. 840-856).

Upregulation of an antigen function (*e.g.*, a B lymphocyte antigen function), as a means of up regulating immune responses, may also be useful in therapy. Upregulation of immune

responses may be in the form of enhancing an existing immune response or eliciting an initial immune response. For example, enhancing an immune response may be useful in cases of viral infection, including systemic viral diseases such as influenza, the common cold, and encephalitis.

Alternatively, anti-viral immune responses may be enhanced in an infected patient by removing T cells from the patient, costimulating the T cells in vitro with viral antigen-pulsed APCs either expressing a peptide of the present invention or together with a stimulatory form of a soluble peptide of the present invention and reintroducing the in vitro activated T cells into the patient. Another method of enhancing anti-viral immune responses would be to isolate infected cells from a patient, transfect them with a nucleic acid encoding a protein of the present invention as described herein such that the cells express all or a portion of the protein on their surface, and reintroduce the transfected cells into the patient. The infected cells would now be capable of delivering a costimulatory signal to, and thereby activate, T cells in vivo.

A polypeptide of the present invention may provide the necessary stimulation signal to T cells to induce a T cell mediated immune response against the transfected tumor cells. In addition, tumor cells which lack MHC class I or MHC class II molecules, or which fail to reexpress sufficient mounts of MHC class I or MHC class II molecules, can be transfected with nucleic acid encoding all or a portion of (*e.g.*, a cytoplasmic-domain truncated portion) of an MHC class I alpha chain protein and β_2 microglobulin protein or an MHC class II alpha chain protein and an MHC class II beta chain protein to thereby express MHC class I or MHC class II proteins on the cell surface. Expression of the appropriate class I or class II MHC in conjunction with a peptide having the activity of a B lymphocyte antigen (*e.g.*, B7-1, B7-2, B7-3) induces a T cell mediated immune response against the transfected tumor cell. Optionally, a gene encoding an antisense construct which blocks expression of an MHC class II associated protein, such as the invariant chain, can also be cotransfected with a DNA encoding a peptide having the activity of a B lymphocyte antigen to promote presentation of tumor associated antigens and induce tumor specific immunity. Thus, the induction of a T cell mediated immune response in a human subject may be sufficient to overcome tumor-specific tolerance in the subject.

The activity of a protein of the invention may, among other means, be measured by the following methods:

Suitable assays for thymocyte or splenocyte cytotoxicity include, without limitation, those described in: Current Protocols in Immunology, Ed by J. E. Coligan, A. M. Kruisbeek, D. H. Margulies, E. M. Shevach, W. Strober, Pub. Greene Publishing Associates and Wiley-Interscience (Chapter 3, In Vitro assays for Mouse Lymphocyte Function 3.1-3.19; Chapter 7, Immunologic studies in Humans); Herrmann et al., Proc. Natl. Acad. Sci. USA

78:2488-2492, 1981; Herrmann et al., J. Immunol. 128:1968-1974, 1982; Handa et al., J. Immunol. 135:1564-1572, 1985; Takai et al., I. Immunol. 137:3494-3500, 1986; Takai et al., J. Immunol. 140:508-512, 1988; Bowman et al., J. Virology 61:1992-1998; Bertagnolli et al., Cellular Immunology 133:327-341, 1991; Brown et al., J. Immunol. 153:3079-3092, 1994.

Assays for T-cell-dependent immunoglobulin responses and isotype switching (which will identify, among others, proteins that modulate T-cell dependent antibody responses and that affect Th1/Th2 profiles) include, without limitation, those described in: Maliszewski, J. Immunol. 144:3028-3033, 1990; and Assays for B cell function: In vitro antibody production, Mond, J. J. and Brunswick, M. In Current Protocols in Immunology. J. E. e.a. Coligan eds. Vol 1 pp. 3.8.1-3.8.16, John Wiley and Sons, Toronto. 1994.

Mixed lymphocyte reaction (MLR) assays (which will identify, among others, proteins that generate predominantly Th1 and CTL responses) include, without limitation, those described in: Current Protocols in Immunology, Ed by J. E. Coligan, A. M. Kruisbeek, D. H. Margulies, E. M. Shevach, W. Strober, Pub. Greene Publishing Associates and Wiley-Interscience (Chapter 3, In Vitro assays for Mouse Lymphocyte Function 3.1-3.19; Chapter 7, Immunologic studies in Humans); Takai et al., J. Immunol. 137:3494-3500, 1986; Takai et al., J. Immunol. 140:508-512, 1988; Bertagnolli et al., J. Immunol. 149:3778-3783, 1992.

Dendritic cell-dependent assays (which will identify, among others, proteins expressed by dendritic cells that activate naive T-cells) include, without limitation, those described in: Guery et al., J. Immunol. 134:536-544, 1995; Inaba et al., Journal of Experimental Medicine 173:549-559, 1991; Macatonia et al., Journal of Immunology 154:5071-5079, 1995; Porgador et al., Journal of Experimental Medicine 182:255-260, 1995; Nair et al., Journal of Virology 67:4062-4069, 1993; Huang et al., Science 264:961-965, 1994; Macatonia et al., Journal of Experimental Medicine 169:1255-1264, 1989; Bhardwaj et al., Journal of Clinical Investigation 94:797-807, 1994; and Inaba et al., Journal of Experimental Medicine 172:631-640, 1990.

Assays for lymphocyte survival/apoptosis (which will identify, among others, proteins that prevent apoptosis after superantigen induction and proteins that regulate lymphocyte homeostasis) include, without limitation, those described in: Darzynkiewicz et al., Cytometry 13:795-808, 1992; Gorczyca et al., Leukemia 7:659-670, 1993; Gorczyca et al., Cancer Research 53:1945-1951, 1993; Itoh et al., Cell 66:233-243, 1991; Zacharchuk, Journal of Immunology 145:4037-4045, 1990; Zamai et al., Cytometry 14:891-897, 1993; Gorczyca et al., International Journal of Oncology 1:639-648, 1992.

Assays for proteins that influence early steps of T-cell commitment and development include, without limitation, those described in: Antica et al., Blood 84:111-117, 1994; Fine et

al., Cellular Immunology 155:111-122, 1994; Galy et al., Blood 85:2770-2778, 1995; Toki et al., Proc. Nat. Acad Sci. USA 88:7548-7551, 1991.

4.10.8 ACTIVIN/INHIBIN ACTIVITY

A polypeptide of the present invention may also exhibit activin- or inhibin-related activities. A polynucleotide of the invention may encode a polypeptide exhibiting such characteristics. Inhibins are characterized by their ability to inhibit the release of follicle stimulating hormone (FSH), while activins and are characterized by their ability to stimulate the release of follicle stimulating hormone (FSH). Thus, a polypeptide of the present invention, alone or in heterodimers with a member of the inhibin family, may be useful as a contraceptive based on the ability of inhibins to decrease fertility in female mammals and decrease spermatogenesis in male mammals. Administration of sufficient amounts of other inhibins can induce infertility in these mammals. Alternatively, the polypeptide of the invention, as a homodimer or as a heterodimer with other protein subunits of the inhibin group, may be useful as a fertility inducing therapeutic, based upon the ability of activin molecules in stimulating FSH release from cells of the anterior pituitary. See, for example, U.S. Pat. No. 4,798,885. A polypeptide of the invention may also be useful for advancement of the onset of fertility in sexually immature mammals, so as to increase the lifetime reproductive performance of domestic animals such as, but not limited to, cows, sheep and pigs.

The activity of a polypeptide of the invention may, among other means, be measured by the following methods.

Assays for activin/inhibin activity include, without limitation, those described in: Vale et al., Endocrinology 91:562-572, 1972; Ling et al., Nature 321:779-782, 1986; Vale et al., Nature 321:776-779, 1986; Mason et al., Nature 318:659-663, 1985; Forage et al., Proc. Natl. Acad. Sci. USA 83:3091-3095, 1986.

4.10.9 CHEMOTACTIC/CHEMOKINETIC ACTIVITY

A polypeptide of the present invention may be involved in chemotactic or chemokinetic activity for mammalian cells, including, for example, monocytes, fibroblasts, neutrophils, T-cells, mast cells, eosinophils, epithelial and/or endothelial cells. A polynucleotide of the invention can encode a polypeptide exhibiting such attributes. Chemotactic and chemokinetic receptor activation can be used to mobilize or attract a desired cell population to a desired site of action. Chemotaetic or chemokinetic compositions (*e.g.* proteins, antibodies, binding partners, or modulators of the invention) provide particular advantages in treatment of wounds and other trauma to tissues, as well as in treatment of localized infections. For example, attraction of

lymphocytes, monocytes or neutrophils to tumors or sites of infection may result in improved immune responses against the tumor or infecting agent.

A protein or peptide has chemotactic activity for a particular cell population if it can stimulate, directly or indirectly, the directed orientation or movement of such cell population. Preferably, the protein or peptide has the ability to directly stimulate directed movement of cells. Whether a particular protein has chemotactic activity for a population of cells can be readily determined by employing such protein or peptide in any known assay for cell chemotaxis.

Therapeutic compositions of the invention can be used in the following:

Assays for chemotactic activity (which will identify proteins that induce or prevent chemotaxis) consist of assays that measure the ability of a protein to induce the migration of cells across a membrane as well as the ability of a protein to induce the adhesion of one cell population to another cell population. Suitable assays for movement and adhesion include, without limitation, those described in: Current Protocols in Immunology, Ed by J. E. Coligan, A. M. Kruisbeek, D. H. Marguiles, E. M. Shevach, W. Strober, Pub. Greene Publishing Associates and Wiley-Interscience (Chapter 6.12, Measurement of alpha and beta Chemokines 6.12.1-6.12.28; Taub et al. J. Clin. Invest. 95:1370-1376, 1995; Lind et al. APMIS 103:140-146, 1995; Muller et al Eur. J. Immunol. 25:1744-1748; Gruber et al. J. of Immunol. 152:5860-5867, 1994; Johnston et al. J. of Immunol. 153:1762-1768, 1994.

4.10.10 HEMOSTATIC AND THROMBOLYTIC ACTIVITY

A polypeptide of the invention may also be involved in hemostatis or thrombolysis or thrombosis. A polynucleotide of the invention can encode a polypeptide exhibiting such attributes. Compositions may be useful in treatment of various coagulation disorders (including hereditary disorders, such as hemophilias) or to enhance coagulation and other hemostatic events in treating wounds resulting from trauma, surgery or other causes. A composition of the invention may also be useful for dissolving or inhibiting formation of thromboses and for treatment and prevention of conditions resulting therefrom (such as, for example, infarction of cardiac and central nervous system vessels (*e.g.*, stroke).

Therapeutic compositions of the invention can be used in the following:

Assay for hemostatic and thrombolytic activity include, without limitation, those described in: Linet et al., J. Clin. Pharmacol. 26:131-140, 1986; Burdick et al., Thrombosis Res. 45:413-419, 1987; Humphrey et al., Fibrinolysis 5:71-79 (1991); Schaub, Prostaglandins 35:467-474, 1988.

4.10.11 CANCER DIAGNOSIS AND THERAPY

Polypeptides of the invention may be involved in cancer cell generation, proliferation or metastasis. Detection of the presence or amount of polynucleotides or polypeptides of the invention may be useful for the diagnosis and/or prognosis of one or more types of cancer. For example, the presence or increased expression of a polynucleotide/polypeptide of the invention may indicate a hereditary risk of cancer, a precancerous condition, or an ongoing malignancy. Conversely, a defect in the gene or absence of the polypeptide may be associated with a cancer condition. Identification of single nucleotide polymorphisms associated with cancer or a predisposition to cancer may also be useful for diagnosis or prognosis.

Cancer treatments promote tumor regression by inhibiting tumor cell proliferation, inhibiting angiogenesis (growth of new blood vessels that is necessary to support tumor growth) and/or prohibiting metastasis by reducing tumor cell motility or invasiveness. Therapeutic compositions of the invention may be effective in adult and pediatric oncology including in solid phase tumors/malignancies, locally advanced tumors, human soft tissue sarcomas, metastatic cancer, including lymphatic metastases, blood cell malignancies including multiple myeloma, acute and chronic leukemias, and lymphomas, head and neck cancers including mouth cancer, larynx cancer and thyroid cancer, lung cancers including small cell carcinoma and non-small cell cancers, breast cancers including small cell carcinoma and ductal carcinoma, gastrointestinal cancers including esophageal cancer, stomach cancer, colon cancer, colorectal cancer and polyps associated with colorectal neoplasia, pancreatic cancers, liver cancer, urologic cancers including bladder cancer and prostate cancer, malignancies of the female genital tract including ovarian carcinoma, uterine (including endometrial) cancers, and solid tumor in the ovarian follicle, kidney cancers including renal cell carcinoma, brain cancers including intrinsic brain tumors, neuroblastoma, astrocytic brain tumors, gliomas, metastatic tumor cell invasion in the central nervous system, bone cancers including osteomas, skin cancers including malignant melanoma, tumor progression of human skin keratinocytes, squamous cell carcinoma, basal cell carcinoma, hemangiopericytoma and Karposi's sarcoma.

Polypeptides, polynucleotides, or modulators of polypeptides of the invention (including inhibitors and stimulators of the biological activity of the polypeptide of the invention) may be administered to treat cancer. Therapeutic compositions can be administered in therapeutically effective dosages alone or in combination with adjuvant cancer therapy such as surgery, chemotherapy, radiotherapy, thermotherapy, and laser therapy, and may provide a beneficial effect, *e.g.* reducing tumor size, slowing rate of tumor growth, inhibiting metastasis, or otherwise improving overall clinical condition, without necessarily eradicating the cancer.

The composition can also be administered in therapeutically effective amounts as a portion of an anti-cancer cocktail. An anti-cancer cocktail is a mixture of the polypeptide or

modulator of the invention with one or more anti-cancer drugs in addition to a pharmaceutically acceptable carrier for delivery. The use of anti-cancer cocktails as a cancer treatment is routine. Anti-cancer drugs that are well known in the art and can be used as a treatment in combination with the polypeptide or modulator of the invention include: Actinomycin D, Aminoglutethimide, Asparaginase, Bleomycin, Busulfan, Carboplatin, Carmustine, Chlorambucil, Cisplatin (cis-DDP), Cyclophosphamide, Cytarabine HCl (Cytosine arabinoside), Dacarbazine, Dactinomycin, Daunorubicin HCl, Doxorubicin HCl, Estramustine phosphate sodium, Etoposide (V16-213), Floxuridine, 5-Fluorouracil (5-Fu), Flutamide, Hydroxyurea (hydroxycarbamide), Ifosfamide, Interferon Alpha-2a, Interferon Alpha-2b, Leuprolide acetate (LHRH-releasing factor analog), Lomustine, Mechlorethamine HCl (nitrogen mustard), Melphalan, Mercaptopurine, Mesna, Methotrexate (MTX), Mitomycin, Mitoxantrone HCl, Octreotide, Plicamycin, Procarbazine HCl, Streptozocin, Tamoxifen citrate, Thioguanine, Thiotepa, Vinblastine sulfate, Vincristine sulfate, Amsacrine, Azacitidine, Hexamethylmelamine, Interleukin-2, Mitoguazone, Pentostatin, Semustine, Teniposide, and Vindesine sulfate.

In addition, therapeutic compositions of the invention may be used for prophylactic treatment of cancer. There are hereditary conditions and/or environmental situations (*e.g.* exposure to carcinogens) known in the art that predispose an individual to developing cancers. Under these circumstances, it may be beneficial to treat these individuals with therapeutically effective doses of the polypeptide of the invention to reduce the risk of developing cancers.

In vitro models can be used to determine the effective doses of the polypeptide of the invention as a potential cancer treatment. These *in vitro* models include proliferation assays of cultured tumor cells, growth of cultured tumor cells in soft agar (see Freshney, (1987) Culture of Animal Cells: A Manual of Basic Technique, Wily-Liss, New York, NY Ch 18 and Ch 21), tumor systems in nude mice as described in Giovanella et al., J. Natl. Can. Inst., 52: 921-30 (1974), mobility and invasive potential of tumor cells in Boyden Chamber assays as described in Pilkington et al., Anticancer Res., 17: 4107-9 (1997), and angiogenesis assays such as induction of vascularization of the chick chorioallantoic membrane or induction of vascular endothelial cell migration as described in Ribatta et al., Intl. J. Dev. Biol., 40: 1189-97 (1999) and Li et al., Clin. Exp. Metastasis, 17:423-9 (1999), respectively. Suitable tumor cells lines are available, *e.g.* from American Type Tissue Culture Collection catalogs.

4.10.12 RECEPTOR/LIGAND ACTIVITY

A polypeptide of the present invention may also demonstrate activity as receptor, receptor ligand or inhibitor or agonist of receptor/ligand interactions. A polynucleotide of the invention can encode a polypeptide exhibiting such characteristics. Examples of such receptors

and ligands include, without limitation, cytokine receptors and their ligands, receptor kinases and their ligands, receptor phosphatases and their ligands, receptors involved in cell-cell interactions and their ligands (including without limitation, cellular adhesion molecules (such as selectins, integrins and their ligands) and receptor/ligand pairs involved in antigen presentation, antigen recognition and development of cellular and humoral immune responses. Receptors and ligands are also useful for screening of potential peptide or small molecule inhibitors of the relevant receptor/ligand interaction. A protein of the present invention (including, without limitation, fragments of receptors and ligands) may themselves be useful as inhibitors of receptor/ligand interactions.

The activity of a polypeptide of the invention may, among other means, be measured by the following methods:

Suitable assays for receptor-ligand activity include without limitation those described in: Current Protocols in Immunology, Ed by J. E. Coligan, A. M. Kruisbeek, D. H. Margulies, E. M. Shevach, W. Strober, Pub. Greene Publishing Associates and Wiley- Interscience (Chapter 7.28, Measurement of Cellular Adhesion under static conditions 7.28.1- 7.28.22), Takai et al., Proc. Natl. Acad. Sci. USA 84:6864-6868, 1987; Bierer et al., J. Exp. Med. 168:1145-1156, 1988; Rosenstein et al., J. Exp. Med. 169:149-160 1989; Stoltenborg et al., J. Immunol. Methods 175:59-68, 1994; Stitt et al., Cell 80:661-670, 1995.

By way of example, the polypeptides of the invention may be used as a receptor for a ligand(s) thereby transmitting the biological activity of that ligand(s). Ligands may be identified through binding assays, affinity chromatography, dihybrid screening assays, BIAcore assays, gel overlay assays, or other methods known in the art.

Studies characterizing drugs or proteins as agonist or antagonist or partial agonists or a partial antagonist require the use of other proteins as competing ligands. The polypeptides of the present invention or ligand(s) thereof may be labeled by being coupled to radioisotopes, colorimetric molecules or toxin molecules by conventional methods. ("Guide to Protein Purification" Murray P. Deutscher (ed) Methods in Enzymology Vol. 182 (1990) Academic Press, Inc. San Diego). Examples of radioisotopes include, but are not limited to, tritium and carbon-14. Examples of colorimetric molecules include, but are not limited to, fluorescent molecules such as fluorescamine, or rhodamine or other colorimetric molecules. Examples of toxins include, but are not limited, to ricin.

4.10.13 DRUG SCREENING

This invention is particularly useful for screening chemical compounds by using the novel polypeptides or binding fragments thereof in any of a variety of drug screening techniques.

The polypeptides or fragments employed in such a test may either be free in solution, affixed to a solid support, borne on a cell surface or located intracellularly. One method of drug screening utilizes eukaryotic or prokaryotic host cells which are stably transformed with recombinant nucleic acids expressing the polypeptide or a fragment thereof. Drugs are screened against such transformed cells in competitive binding assays. Such cells, either in viable or fixed form, can be used for standard binding assays. One may measure, for example, the formation of complexes between polypeptides of the invention or fragments and the agent being tested or examine the diminution in complex formation between the novel polypeptides and an appropriate cell line, which are well known in the art.

Sources for test compounds that may be screened for ability to bind to or modulate (*i.e.*, increase or decrease) the activity of polypeptides of the invention include (1) inorganic and organic chemical libraries, (2) natural product libraries, and (3) combinatorial libraries comprised of either random or mimetic peptides, oligonucleotides or organic molecules.

Chemical libraries may be readily synthesized or purchased from a number of commercial sources, and may include structural analogs of known compounds or compounds that are identified as "hits" or "leads" via natural product screening.

The sources of natural product libraries are microorganisms (including bacteria and fungi), animals, plants or other vegetation, or marine organisms, and libraries of mixtures for screening may be created by: (1) fermentation and extraction of broths from soil, plant or marine microorganisms or (2) extraction of the organisms themselves. Natural product libraries include polyketides, non-ribosomal peptides, and (non-naturally occurring) variants thereof. For a review, see *Science 282*:63-68 (1998).

Combinatorial libraries are composed of large numbers of peptides, oligonucleotides or organic compounds and can be readily prepared by traditional automated synthesis methods, PCR, cloning or proprietary synthetic methods. Of particular interest are peptide and oligonucleotide combinatorial libraries. Still other libraries of interest include peptide, protein, peptidomimetic, multiparallel synthetic collection, recombinatorial, and polypeptide libraries. For a review of combinatorial chemistry and libraries created therefrom, see Myers, *Curr. Opin. Biotechnol.* 8:701-707 (1997). For reviews and examples of peptidomimetic libraries, see Al-Obeidi et al., *Mol. Biotechnol*, 9(3):205-23 (1998); Hruby et al., *Curr Opin Chem Biol*, 1(1):114-19 (1997); Dorner et al., *Bioorg Med Chem*, 4(5):709-15 (1996) (alkylated dipeptides).

Identification of modulators through use of the various libraries described herein permits modification of the candidate "hit" (or "lead") to optimize the capacity of the "hit" to bind a polypeptide of the invention. The molecules identified in the binding assay are then tested for antagonist or agonist activity in *in vivo* tissue culture or animal models that are well known in the

art. In brief, the molecules are titrated into a plurality of cell cultures or animals and then tested for either cell/animal death or prolonged survival of the animal/cells.

The binding molecules thus identified may be complexed with toxins, *e.g.*, ricin or cholera, or with other compounds that are toxic to cells such as radioisotopes. The toxin-binding molecule complex is then targeted to a tumor or other cell by the specificity of the binding molecule for a polypeptide of the invention. Alternatively, the binding molecules may be complexed with imaging agents for targeting and imaging purposes.

4.10.14 ASSAY FOR RECEPTOR ACTIVITY

The invention also provides methods to detect specific binding of a polypeptide *e.g.* a ligand or a receptor. The art provides numerous assays particularly useful for identifying previously unknown binding partners for receptor polypeptides of the invention. For example, expression cloning using mammalian or bacterial cells, or dihybrid screening assays can be used to identify polynucleotides encoding binding partners. As another example, affinity chromatography with the appropriate immobilized polypeptide of the invention can be used to isolate polypeptides that recognize and bind polypeptides of the invention. There are a number of different libraries used for the identification of compounds, and in particular small molecules, that modulate (*i.e.*, increase or decrease) biological activity of a polypeptide of the invention. Ligands for receptor polypeptides of the invention can also be identified by adding exogenous ligands, or cocktails of ligands to two cells populations that are genetically identical except for the expression of the receptor of the invention: one cell population expresses the receptor of the invention whereas the other does not. The responses of the two cell populations to the addition of ligands(s) are then compared. Alternatively, an expression library can be co-expressed with the polypeptide of the invention in cells and assayed for an autocrine response to identify potential ligand(s). As still another example, BIAcore assays, gel overlay assays, or other methods known in the art can be used to identify binding partner polypeptides, including, (1) organic and inorganic chemical libraries, (2) natural product libraries, and (3) combinatorial libraries comprised of random peptides, oligonucleotides or organic molecules.

The role of downstream intracellular signaling molecules in the signaling cascade of the polypeptide of the invention can be determined. For example, a chimeric protein in which the cytoplasmic domain of the polypeptide of the invention is fused to the extracellular portion of a protein, whose ligand has been identified, is produced in a host cell. The cell is then incubated with the ligand specific for the extracellular portion of the chimeric protein, thereby activating the chimeric receptor. Known downstream proteins involved in intracellular signaling can then

be assayed for expected modifications *i.e.* phosphorylation. Other methods known to those in the art can also be used to identify signaling molecules involved in receptor activity.

4.10.15 ANTI-INFLAMMATORY ACTIVITY

Compositions of the present invention may also exhibit anti-inflammatory activity. The anti-inflammatory activity may be achieved by providing a stimulus to cells involved in the inflammatory response, by inhibiting or promoting cell-cell interactions (such as, for example, cell adhesion), by inhibiting or promoting chemotaxis of cells involved in the inflammatory process, inhibiting or promoting cell extravasation, or by stimulating or suppressing production of other factors which more directly inhibit or promote an inflammatory response. Compositions with such activities can be used to treat inflammatory conditions including chronic or acute conditions), including without limitation intimation associated with infection (such as septic shock, sepsis or systemic inflammatory response syndrome (SIRS)), ischemia-reperfusion injury, endotoxin lethality, arthritis, complement-mediated hyperacute rejection, nephritis, cytokine or chemokine-induced lung injury, inflammatory bowel disease, Crohn's disease or resulting from over production of cytokines such as TNF or IL-1. Compositions of the invention may also be useful to treat anaphylaxis and hypersensitivity to an antigenic substance or material. Compositions of this invention may be utilized to prevent or treat conditions such as, but not limited to, sepsis, acute pancreatitis, endotoxin shock, cytokine induced shock, rheumatoid arthritis, chronic inflammatory arthritis, pancreatic cell damage from diabetes mellitus type 1, graft versus host disease, inflammatory bowel disease, inflamation associated with pulmonary disease, other autoimmune disease or inflammatory disease, an antiproliferative agent such as for acute or chronic mylegenous leukemia or in the prevention of premature labor secondary to intrauterine infections.

4.10.16 LEUKEMIAS

Leukemias and related disorders may be treated or prevented by administration of a therapeutic that promotes or inhibits function of the polynucleotides and/or polypeptides of the invention. Such leukemias and related disorders include but are not limited to acute leukemia, acute lymphocytic leukemia, acute myelocytic leukemia, myeloblastic, promyelocytic, myelomonocytic, monocytic, erythroleukemia, chronic leukemia, chronic myelocytic (granulocytic) leukemia and chronic lymphocytic leukemia (for a review of such disorders, see Fishman et al., 1985, Medicine, 2d Ed., J.B. Lippincott Co., Philadelphia).

4.10.17 NERVOUS SYSTEM DISORDERS

Nervous system disorders, involving cell types which can be tested for efficacy of intervention with compounds that modulate the activity of the polynucleotides and/or polypeptides of the invention, and which can be treated upon thus observing an indication of therapeutic utility, include but are not limited to nervous system injuries, and diseases or disorders which result in either a disconnection of axons, a diminution or degeneration of neurons, or demyelination. Nervous system lesions which may be treated in a patient (including human and non-human mammalian patients) according to the invention include but are not limited to the following lesions of either the central (including spinal cord, brain) or peripheral nervous systems:

(i) traumatic lesions, including lesions caused by physical injury or associated with surgery, for example, lesions which sever a portion of the nervous system, or compression injuries;

(ii) ischemic lesions, in which a lack of oxygen in a portion of the nervous system results in neuronal injury or death, including cerebral infarction or ischemia, or spinal cord infarction or ischemia;

(iii) infectious lesions, in which a portion of the nervous system is destroyed or injured as a result of infection, for example, by an abscess or associated with infection by human immunodeficiency virus, herpes zoster, or herpes simplex virus or with Lyme disease, tuberculosis, syphilis;

(iv) degenerative lesions, in which a portion of the nervous system is destroyed or injured as a result of a degenerative process including but not limited to degeneration associated with Parkinson's disease, Alzheimer's disease, Huntington's chorea, or amyotrophic lateral sclerosis;

(v) lesions associated with nutritional diseases or disorders, in which a portion of the nervous system is destroyed or injured by a nutritional disorder or disorder of metabolism including but not limited to, vitamin B12 deficiency, folic acid deficiency, Wernicke disease, tobacco-alcohol amblyopia, Marchiafava-Bignami disease (primary degeneration of the corpus callosum), and alcoholic cerebellar degeneration;

(vi) neurological lesions associated with systemic diseases including but not limited to diabetes (diabetic neuropathy, Bell's palsy), systemic lupus erythematosus, carcinoma, or sarcoidosis;

(vii) lesions caused by toxic substances including alcohol, lead, or particular neurotoxins; and

(viii) demyelinated lesions in which a portion of the nervous system is destroyed or injured by a demyelinating disease including but not limited to multiple sclerosis, human

immunodeficiency virus-associated myelopathy, transverse myelopathy or various etiologies, progressive multifocal leukoencephalopathy, and central pontine myelinolysis.

Therapeutics which are useful according to the invention for treatment of a nervous system disorder may be selected by testing for biological activity in promoting the survival or differentiation of neurons. For example, and not by way of limitation, therapeutics which elicit any of the following effects may be useful according to the invention:

(i) increased survival time of neurons in culture;

(ii) increased sprouting of neurons in culture or in vivo;

(iii) increased production of a neuron-associated molecule in culture or *in vivo, e.g.*, choline acetyltransferase or acetylcholinesterase with respect to motor neurons; or

(iv) decreased symptoms of neuron dysfunction in vivo.

Such effects may be measured by any method known in the art. In preferred, non-limiting embodiments, increased survival of neurons may be measured by the method set forth in Arakawa et al. (1990, J. Neurosci. 10:3507-3515); increased sprouting of neurons may be detected by methods set forth in Pestronk et al. (1980, Exp. Neurol. 70:65-82) or Brown et al. (1981, Ann. Rev. Neurosci. 4:17-42); increased production of neuron-associated molecules may be measured by bioassay, enzymatic assay, antibody binding, Northern blot assay, *etc.*, depending on the molecule to be measured; and motor neuron dysfunction may be measured by assessing the physical manifestation of motor neuron disorder, *e.g.*, weakness, motor neuron conduction velocity, or functional disability.

In specific embodiments, motor neuron disorders that may be treated according to the invention include but are not limited to disorders such as infarction, infection, exposure to toxin, trauma, surgical damage, degenerative disease or malignancy that may affect motor neurons as well as other components of the nervous system, as well as disorders that selectively affect neurons such as amyotrophic lateral sclerosis, and including but not limited to progressive spinal muscular atrophy, progressive bulbar palsy, primary lateral sclerosis, infantile and juvenile muscular atrophy, progressive bulbar paralysis of childhood (Fazio-Londe syndrome), poliomyelitis and the post polio syndrome, and Hereditary Motorsensory Neuropathy (Charcot-Marie-Tooth Disease).

4.10.18 OTHER ACTIVITIES

A polypeptide of the invention may also exhibit one or more of the following additional activities or effects: inhibiting the growth, infection or function of, or killing, infectious agents, including, without limitation, bacteria, viruses, fungi and other parasites; effecting (suppressing or enhancing) bodily characteristics, including, without limitation, height, weight, hair color, eye

color, skin, fat to lean ratio or other tissue pigmentation, or organ or body part size or shape (such as, for example, breast augmentation or diminution, change in bone form or shape); effecting biorhythms or circadian cycles or rhythms; effecting the fertility of male or female subjects; effecting the metabolism, catabolism, anabolism, processing, utilization, storage or elimination of dietary fat, lipid, protein, carbohydrate, vitamins, minerals, co-factors or other nutritional factors or component(s); effecting behavioral characteristics, including, without limitation, appetite, libido, stress, cognition (including cognitive disorders), depression (including depressive disorders) and violent behaviors; providing analgesic effects or other pain reducing effects; promoting differentiation and growth of embryonic stem cells in lineages other than hematopoietic lineages; hormonal or endocrine activity; in the case of enzymes, correcting deficiencies of the enzyme and treating deficiency-related diseases; treatment of hyperproliferative disorders (such as, for example, psoriasis); immunoglobulin-like activity (such as, for example, the ability to bind antigens or complement); and the ability to act as an antigen in a vaccine composition to raise an immune response against such protein or another material or entity which is cross-reactive with such protein.

4.10.19 IDENTIFICATION OF POLYMORPHISMS

The demonstration of polymorphisms makes possible the identification of such polymorphisms in human subjects and the pharmacogenetic use of this information for diagnosis and treatment. Such polymorphisms may be associated with, *e.g.*, differential predisposition or susceptibility to various disease states (such as disorders involving inflammation or immune response) or a differential response to drug administration, and this genetic information can be used to tailor preventive or therapeutic treatment appropriately. For example, the existence of a polymorphism associated with a predisposition to inflammation or autoimmune disease makes possible the diagnosis of this condition in humans by identifying the presence of the polymorphism.

Polymorphisms can be identified in a variety of ways known in the art which all generally involve obtaining a sample from a patient, analyzing DNA from the sample, optionally involving isolation or amplification of the DNA, and identifying the presence of the polymorphism in the DNA. For example, PCR may be used to amplify an appropriate fragment of genomic DNA which may then be sequenced. Alternatively, the DNA may be subjected to allele-specific oligonucleotide hybridization (in which appropriate oligonucleotides are hybridized to the DNA under conditions permitting detection of a single base mismatch) or to a single nucleotide extension assay (in which an oligonucleotide that hybridizes immediately adjacent to the position of the polymorphism is extended with one or more labeled nucleotides).

In addition, traditional restriction fragment length polymorphism analysis (using restriction enzymes that provide differential digestion of the genomic DNA depending on the presence or absence of the polymorphism) may be performed. Arrays with nucleotide sequences of the present invention can be used to detect polymorphisms. The array can comprise modified nucleotide sequences of the present invention in order to detect the nucleotide sequences of the present invention. In the alternative, any one of the nucleotide sequences of the present invention can be placed on the array to detect changes from those sequences.

Alternatively a polymorphism resulting in a change in the amino acid sequence could also be detected by detecting a corresponding change in amino acid sequence of the protein, *e.g.*, by an antibody specific to the variant sequence.

4.10.20 ARTHRITIS AND INFLAMMATION

The immunosuppressive effects of the compositions of the invention against rheumatoid arthritis are determined in an experimental animal model system. The experimental model system is adjuvant induced arthritis in rats, and the protocol is described by J. Holoshitz, et at., 1983, Science, 219:56, or by B. Waksman et al., 1963, Int. Arch. Allergy Appl. Immunol., 23:129. Induction of the disease can be caused by a single injection, generally intradermally, of a suspension of killed Mycobacterium tuberculosis in complete Freund's adjuvant (CFA). The route of injection can vary, but rats may be injected at the base of the tail with an adjuvant mixture. The polypeptide is administered in phosphate buffered solution (PBS) at a dose of about 1-5 mg/kg. The control consists of administering PBS only.

The procedure for testing the effects of the test compound would consist of intradermally injecting killed Mycobacterium tuberculosis in CFA followed by immediately administering the test compound and subsequent treatment every other day until day 24. At 14, 15, 18, 20, 22, and 24 days after injection of Mycobacterium CFA, an overall arthritis score may be obtained as described by J. Holoskitz above. An analysis of the data would reveal that the test compound would have a dramatic affect on the swelling of the joints as measured by a decrease of the arthritis score.

4.11 THERAPEUTIC METHODS

The compositions (including polypeptide fragments, analogs, variants and antibodies or other binding partners or modulators including antisense polynucleotides) of the invention have numerous applications in a variety of therapeutic methods. Examples of therapeutic applications include, but are not limited to, those exemplified herein.

4.11.1 EXAMPLE

One embodiment of the invention is the administration of an effective amount of the polypeptides or other composition of the invention to individuals affected by a disease or disorder that can be modulated by regulating the peptides of the invention. While the mode of administration is not particularly important, parenteral administration is preferred. An exemplary mode of administration is to deliver an intravenous bolus. The dosage of the polypeptides or other composition of the invention will normally be determined by the prescribing physician. It is to be expected that the dosage will vary according to the age, weight, condition and response of the individual patient. Typically, the amount of polypeptide administered per dose will be in the range of about 0.01μg/kg to 100 mg/kg of body weight, with the preferred dose being about 0.1μg/kg to 10 mg/kg of patient body weight. For parenteral administration, polypeptides of the invention will be formulated in an injectable form combined with a pharmaceutically acceptable parenteral vehicle. Such vehicles are well known in the art and examples include water, saline, Ringer's solution, dextrose solution, and solutions consisting of small amounts of the human serum albumin. The vehicle may contain minor amounts of additives that maintain the isotonicity and stability of the polypeptide or other active ingredient. The preparation of such solutions is within the skill of the art.

4.12 PHARMACEUTICAL FORMULATIONS AND ROUTES OF ADMINISTRATION

A protein or other composition of the present invention (from whatever source derived, including without limitation from recombinant and non-recombinant sources and including antibodies and other binding partners of the polypeptides of the invention) may be administered to a patient in need, by itself, or in pharmaceutical compositions where it is mixed with suitable carriers or excipient(s) at doses to treat or ameliorate a variety of disorders. Such a composition may optionally contain (in addition to protein or other active ingredient and a carrier) diluents, fillers, salts, buffers, stabilizers, solubilizers, and other materials well known in the art. The term "pharmaceutically acceptable" means a non-toxic material that does not interfere with the effectiveness of the biological activity of the active ingredient(s). The characteristics of the carrier will depend on the route of administration. The pharmaceutical composition of the invention may also contain cytokines, lymphokines, or other hematopoietic factors such as M-CSF, GM-CSF, TNF, IL-1, IL-2, IL-3, IL-4, IL-5, IL-6, IL-7, IL-8, IL-9, IL-10, IL-11, IL-12, IL-13, IL-14, IL-15, IFN, TNF0, TNF1, TNF2, G-CSF, Meg-CSF, thrombopoietin, stem cell factor, and erythropoietin. In further compositions, proteins of the invention may be combined with other agents beneficial to the treatment of the disease or disorder in question. These agents

include various growth factors such as epidermal growth factor (EGF), platelet-derived growth factor (PDGF), transforming growth factors (TGF-α and TGF-β), insulin-like growth factor (IGF), as well as cytokines described herein.

The pharmaceutical composition may further contain other agents which either enhance the activity of the protein or other active ingredient or complement its activity or use in treatment. Such additional factors and/or agents may be included in the pharmaceutical composition to produce a synergistic effect with protein or other active ingredient of the invention, or to minimize side effects. Conversely, protein or other active ingredient of the present invention may be included in formulations of the particular clotting factor, cytokine, lymphokine, other hematopoietic factor, thrombolytic or anti-thrombotic factor, or anti-inflammatory agent to minimize side effects of the clotting factor, cytokine, lymphokine, other hematopoietic factor, thrombolytic or anti-thrombotic factor, or anti-inflammatory agent (such as IL-1Ra, IL-1 Hy1, IL-1 Hy2, anti-TNF, corticosteroids, immunosuppressive agents). A protein of the present invention may be active in multimers (*e.g.*, heterodimers or homodimers) or complexes with itself or other proteins. As a result, pharmaceutical compositions of the invention may comprise a protein of the invention in such multimeric or complexed form.

As an alternative to being included in a pharmaceutical composition of the invention including a first protein, a second protein or a therapeutic agent may be concurrently administered with the first protein (*e.g.*, at the same time, or at differing times provided that therapeutic concentrations of the combination of agents is achieved at the treatment site). Techniques for formulation and administration of the compounds of the instant application may be found in "Remington's Pharmaceutical Sciences," Mack Publishing Co., Easton, PA, latest edition. A therapeutically effective dose further refers to that amount of the compound sufficient to result in amelioration of symptoms, *e.g.*, treatment, healing, prevention or amelioration of the relevant medical condition, or an increase in rate of treatment, healing, prevention or amelioration of such conditions. When applied to an individual active ingredient, administered alone, a therapeutically effective dose refers to that ingredient alone. When applied to a combination, a therapeutically effective dose refers to combined amounts of the active ingredients that result in the therapeutic effect, whether administered in combination, serially or simultaneously.

In practicing the method of treatment or use of the present invention, a therapeutically effective amount of protein or other active ingredient of the present invention is administered to a mammal having a condition to be treated. Protein or other active ingredient of the present invention may be administered in accordance with the method of the invention either alone or in combination with other therapies such as treatments employing cytokines, lymphokines or other

hematopoietic factors. When co- administered with one or more cytokines, lymphokines or other hematopoietic factors, protein or other active ingredient of the present invention may be administered either simultaneously with the cytokine(s), lymphokine(s), other hematopoietic factor(s), thrombolytic or anti-thrombotic factors, or sequentially. If administered sequentially, the attending physician will decide on the appropriate sequence of administering protein or other active ingredient of the present invention in combination with cytokine(s), lymphokine(s), other hematopoietic factor(s), thrombolytic or anti-thrombotic factors.

4.12.1 ROUTES OF ADMINISTRATION

Suitable routes of administration may, for example, include oral, rectal, transmucosal, or intestinal administration; parenteral delivery, including intramuscular, subcutaneous, intramedullary injections, as well as intrathecal, direct intraventricular, intravenous, intraperitoneal, intranasal, or intraocular injections. Administration of protein or other active ingredient of the present invention used in the pharmaceutical composition or to practice the method of the present invention can be carried out in a variety of conventional ways, such as oral ingestion, inhalation, topical application or cutaneous, subcutaneous, intraperitoneal, parenteral or intravenous injection. Intravenous administration to the patient is preferred.

Alternately, one may administer the compound in a local rather than systemic manner, for example, via injection of the compound directly into a arthritic joints or in fibrotic tissue, often in a depot or sustained release formulation. In order to prevent the scarring process frequently occurring as complication of glaucoma surgery, the compounds may be administered topically, for example, as eye drops. Furthermore, one may administer the drug in a targeted drug delivery system, for example, in a liposome coated with a specific antibody, targeting, for example, arthritic or fibrotic tissue. The liposomes will be targeted to and taken up selectively by the afflicted tissue.

The polypeptides of the invention are administered by any route that delivers an effective dosage to the desired site of action. The determination of a suitable route of administration and an effective dosage for a particular indication is within the level of skill in the art. Preferably for wound treatment, one administers the therapeutic compound directly to the site. Suitable dosage ranges for the polypeptides of the invention can be extrapolated from these dosages or from similar studies in appropriate animal models. Dosages can then be adjusted as necessary by the clinician to provide maximal therapeutic benefit.

4.12.2 COMPOSITIONS/FORMULATIONS

Pharmaceutical compositions for use in accordance with the present invention thus may be formulated in a conventional manner using one or more physiologically acceptable carriers comprising excipients and auxiliaries which facilitate processing of the active compounds into preparations which can be used pharmaceutically. These pharmaceutical compositions may be manufactured in a manner that is itself known, *e.g.*, by means of conventional mixing, dissolving, granulating, dragee-making, levigating, emulsifying, encapsulating, entrapping or lyophilizing processes. Proper formulation is dependent upon the route of administration chosen. When a therapeutically effective amount of protein or other active ingredient of the present invention is administered orally, protein or other active ingredient of the present invention will be in the form of a tablet, capsule, powder, solution or elixir. When administered in tablet form, the pharmaceutical composition of the invention may additionally contain a solid carrier such as a gelatin or an adjuvant. The tablet, capsule, and powder contain from about 5 to 95% protein or other active ingredient of the present invention, and preferably from about 25 to 90% protein or other active ingredient of the present invention. When administered in liquid form, a liquid carrier such as water, petroleum, oils of animal or plant origin such as peanut oil, mineral oil, soybean oil, or sesame oil, or synthetic oils may be added. The liquid form of the pharmaceutical composition may further contain physiological saline solution, dextrose or other saccharide solution, or glycols such as ethylene glycol, propylene glycol or polyethylene glycol. When administered in liquid form, the pharmaceutical composition contains from about 0.5 to 90% by weight of protein or other active ingredient of the present invention, and preferably from about 1 to 50% protein or other active ingredient of the present invention.

When a therapeutically effective amount of protein or other active ingredient of the present invention is administered by intravenous, cutaneous or subcutaneous injection, protein or other active ingredient of the present invention will be in the form of a pyrogen-free, parenterally acceptable aqueous solution. The preparation of such parenterally acceptable protein or other active ingredient solutions, having due regard to pH, isotonicity, stability, and the like, is within the skill in the art. A preferred pharmaceutical composition for intravenous, cutaneous, or subcutaneous injection should contain, in addition to protein or other active ingredient of the present invention, an isotonic vehicle such as Sodium Chloride Injection, Ringer's Injection, Dextrose Injection, Dextrose and Sodium Chloride Injection, Lactated Ringer's Injection, or other vehicle as known in the art. The pharmaceutical composition of the present invention may also contain stabilizers, preservatives, buffers, antioxidants, or other additives known to those of skill in the art. For injection, the agents of the invention may be formulated in aqueous solutions, preferably in physiologically compatible buffers such as Hanks's solution, Ringer's solution, or physiological saline buffer. For transmucosal administration, penetrants appropriate

to the barrier to be permeated are used in the formulation. Such penetrants are generally known in the art.

For oral administration, the compounds can be formulated readily by combining the active compounds with pharmaceutically acceptable carriers well known in the art. Such carriers enable the compounds of the invention to be formulated as tablets, pills, dragees, capsules, liquids, gels, syrups, slurries, suspensions and the like, for oral ingestion by a patient to be treated. Pharmaceutical preparations for oral use can be obtained from a solid excipient, optionally grinding a resulting mixture, and processing the mixture of granules, after adding suitable auxiliaries, if desired, to obtain tablets or dragee cores. Suitable excipients are, in particular, fillers such as sugars, including lactose, sucrose, mannitol, or sorbitol; cellulose preparations such as, for example, maize starch, wheat starch, rice starch, potato starch, gelatin, gum tragacanth, methyl cellulose, hydroxypropylmethyl-cellulose, sodium carboxymethylcellulose, and/or polyvinylpyrrolidone (PVP). If desired, disintegrating agents may be added, such as the cross-linked polyvinyl pyrrolidone, agar, or alginic acid or a salt thereof such as sodium alginate. Dragee cores are provided with suitable coatings. For this purpose, concentrated sugar solutions may be used, which may optionally contain gum arabic, talc, polyvinyl pyrrolidone, carbopol gel, polyethylene glycol, and/or titanium dioxide, lacquer solutions, and suitable organic solvents or solvent mixtures. Dyestuffs or pigments may be added to the tablets or dragee coatings for identification or to characterize different combinations of active compound doses.

Pharmaceutical preparations which can be used orally include push-fit capsules made of gelatin, as well as soft, sealed capsules made of gelatin and a plasticizer, such as glycerol or sorbitol. The push-fit capsules can contain the active ingredients in admixture with filler such as lactose, binders such as starches, and/or lubricants such as talc or magnesium stearate and, optionally, stabilizers. In soft capsules, the active compounds may be dissolved or suspended in suitable liquids, such as fatty oils, liquid paraffin, or liquid polyethylene glycols. In addition, stabilizers may be added. All formulations for oral administration should be in dosages suitable for such administration. For buccal administration, the compositions may take the form of tablets or lozenges formulated in conventional manner.

For administration by inhalation, the compounds for use according to the present invention are conveniently delivered in the form of an aerosol spray presentation from pressurized packs or a nebuliser, with the use of a suitable propellant, *e.g.*, dichlorodifluoromethane, trichlorofluoromethane, dichlorotetrafluoroethane, carbon dioxide or other suitable gas. In the case of a pressurized aerosol the dosage unit may be determined by providing a valve to deliver a metered amount. Capsules and cartridges of, *e.g.*, gelatin for use

in an inhaler or insufflator may be formulated containing a powder mix of the compound and a suitable powder base such as lactose or starch. The compounds may be formulated for parenteral administration by injection, *e.g.*, by bolus injection or continuous infusion. Formulations for injection may be presented in unit dosage form, *e.g.*, in ampules or in multi-dose containers, with an added preservative. The compositions may take such forms as suspensions, solutions or emulsions in oily or aqueous vehicles, and may contain formulatory agents such as suspending, stabilizing and/or dispersing agents.

Pharmaceutical formulations for parenteral administration include aqueous solutions of the active compounds in water-soluble form. Additionally, suspensions of the active compounds may be prepared as appropriate oily injection suspensions. Suitable lipophilic solvents or vehicles include fatty oils such as sesame oil, or synthetic fatty acid esters, such as ethyl oleate or triglycerides, or liposomes. Aqueous injection suspensions may contain substances which increase the viscosity of the suspension, such as sodium carboxymethyl cellulose, sorbitol, or dextran. Optionally, the suspension may also contain suitable stabilizers or agents which increase the solubility of the compounds to allow for the preparation of highly concentrated solutions. Alternatively, the active ingredient may be in powder form for constitution with a suitable vehicle, *e.g.*, sterile pyrogen-free water, before use.

The compounds may also be formulated in rectal compositions such as suppositories or retention enemas, *e.g.*, containing conventional suppository bases such as cocoa butter or other glycerides. In addition to the formulations described previously, the compounds may also be formulated as a depot preparation. Such long acting formulations may be administered by implantation (for example subcutaneously or intramuscularly) or by intramuscular injection. Thus, for example, the compounds may be formulated with suitable polymeric or hydrophobic materials (for example as an emulsion in an acceptable oil) or ion exchange resins, or as sparingly soluble derivatives, for example, as a sparingly soluble salt.

A pharmaceutical carrier for the hydrophobic compounds of the invention is a co-solvent system comprising benzyl alcohol, a nonpolar surfactant, a water-miscible organic polymer, and an aqueous phase. The co-solvent system may be the VPD co-solvent system. VPD is a solution of 3% w/v benzyl alcohol, 8% w/v of the nonpolar surfactant polysorbate 80, and 65% w/v polyethylene glycol 300, made up to volume in absolute ethanol. The VPD co-solvent system (VPD:5W) consists of VPD diluted 1:1 with a 5% dextrose in water solution. This co-solvent system dissolves hydrophobic compounds well, and itself produces low toxicity upon systemic administration. Naturally, the proportions of a co-solvent system may be varied considerably without destroying its solubility and toxicity characteristics. Furthermore, the identity of the co-solvent components may be varied: for example, other low-toxicity nonpolar surfactants may

be used instead of polysorbate 80; the fraction size of polyethylene glycol may be varied; other biocompatible polymers may replace polyethylene glycol, *e.g.* polyvinyl pyrrolidone; and other sugars or polysaccharides may substitute for dextrose. Alternatively, other delivery systems for hydrophobic pharmaceutical compounds may be employed. Liposomes and emulsions are well known examples of delivery vehicles or carriers for hydrophobic drugs. Certain organic solvents such as dimethylsulfoxide also may be employed, although usually at the cost of greater toxicity. Additionally, the compounds may be delivered using a sustained-release system, such as semipermeable matrices of solid hydrophobic polymers containing the therapeutic agent. Various types of sustained-release materials have been established and are well known by those skilled in the art. Sustained-release capsules may, depending on their chemical nature, release the compounds for a few weeks up to over 100 days. Depending on the chemical nature and the biological stability of the therapeutic reagent, additional strategies for protein or other active ingredient stabilization may be employed.

The pharmaceutical compositions also may comprise suitable solid or gel phase carriers or excipients. Examples of such carriers or excipients include but are not limited to calcium carbonate, calcium phosphate, various sugars, starches, cellulose derivatives, gelatin, and polymers such as polyethylene glycols. Many of the active ingredients of the invention may be provided as salts with pharmaceutically compatible counter ions. Such pharmaceutically acceptable base addition salts are those salts which retain the biological effectiveness and properties of the free acids and which are obtained by reaction with inorganic or organic bases such as sodium hydroxide, magnesium hydroxide, ammonia, trialkylamine, dialkylamine, monoalkylamine, dibasic amino acids, sodium acetate, potassium benzoate, triethanol amine and the like.

The pharmaceutical composition of the invention may be in the form of a complex of the protein(s) or other active ingredient(s) of present invention along with protein or peptide antigens. The protein and/or peptide antigen will deliver a stimulatory signal to both B and T lymphocytes. B-lymphocytes will respond to antigen through their surface immunoglobulin receptor. T lymphocytes will respond to antigen through the T cell receptor (TCR) following presentation of the antigen by MHC proteins. MHC and structurally related proteins including those encoded by class I and class II MHC genes on host cells will serve to present the peptide antigen(s) to T lymphocytes. The antigen components could also be supplied as purified MHC-peptide complexes alone or with co-stimulatory molecules that can directly signal T cells. Alternatively antibodies able to bind surface immunoglobulin and other molecules on B cells as well as antibodies able to bind the TCR and other molecules on T cells can be combined with the pharmaceutical composition of the invention.

The pharmaceutical composition of the invention may be in the form of a liposome in which protein of the present invention is combined, in addition to other pharmaceutically acceptable carriers, with amphipathic agents such as lipids which exist in aggregated form as micelles, insoluble monolayers, liquid crystals, or lamellar layers in aqueous solution. Suitable lipids for liposomal formulation include, without limitation, monoglycerides, diglycerides, sulfatides, lysolecithins, phospholipids, saponin, bile acids, and the like. Preparation of such liposomal formulations is within the level of skill in the art, as disclosed, for example, in U.S. Patent Nos. 4,235,871; 4,501,728; 4,837,028; and 4,737,323, all of which are incorporated herein by reference.

The amount of protein or other active ingredient of the present invention in the pharmaceutical composition of the present invention will depend upon the nature and severity of the condition being treated, and on the nature of prior treatments which the patient has undergone. Ultimately, the attending physician will decide the amount of protein or other active ingredient of the present invention with which to treat each individual patient. Initially, the attending physician will administer low doses of protein or other active ingredient of the present invention and observe the patient's response. Larger doses of protein or other active ingredient of the present invention may be administered until the optimal therapeutic effect is obtained for the patient, and at that point the dosage is not increased further. It is contemplated that the various pharmaceutical compositions used to practice the method of the present invention should contain about 0.01 μg to about 100 mg (preferably about 0.1 μg to about 10 mg, more preferably about 0.1 μg to about 1 mg) of protein or other active ingredient of the present invention per kg body weight. For compositions of the present invention which are useful for bone, cartilage, tendon or ligament regeneration, the therapeutic method includes administering the composition topically, systematically, or locally as an implant or device. When administered, the therapeutic composition for use in this invention is, of course, in a pyrogen-free, physiologically acceptable form. Further, the composition may desirably be encapsulated or injected in a viscous form for delivery to the site of bone, cartilage or tissue damage. Topical administration may be suitable for wound healing and tissue repair. Therapeutically useful agents other than a protein or other active ingredient of the invention which may also optionally be included in the composition as described above, may alternatively or additionally, be administered simultaneously or sequentially with the composition in the methods of the invention. Preferably for bone and/or cartilage formation, the composition would include a matrix capable of delivering the protein-containing or other active ingredient-containing composition to the site of bone and/or cartilage damage, providing a structure for the developing bone and cartilage and optimally

capable of being resorbed into the body. Such matrices may be formed of materials presently in use for other implanted medical applications.

The choice of matrix material is based on biocompatibility, biodegradability, mechanical properties, cosmetic appearance and interface properties. The particular application of the compositions will define the appropriate formulation. Potential matrices for the compositions may be biodegradable and chemically defined calcium sulfate, tricalcium phosphate, hydroxyapatite, polylactic acid, polyglycolic acid and polyanhydrides. Other potential materials are biodegradable and biologically well-defined, such as bone or dermal collagen. Further matrices are comprised of pure proteins or extracellular matrix components. Other potential matrices are nonbiodegradable and chemically defined, such as sintered hydroxyapatite, bioglass, aluminates, or other ceramics. Matrices may be comprised of combinations of any of the above-mentioned types of material, such as polylactic acid and hydroxyapatite or collagen and tricalcium phosphate. The bioceramics may be altered in composition, such as in calcium-aluminate-phosphate and processing to alter pore size, particle size, particle shape, and biodegradability. Presently preferred is a 50:50 (mole weight) copolymer of lactic acid and glycolic acid in the form of porous particles having diameters ranging from 150 to 800 microns. In some applications, it will be useful to utilize a sequestering agent, such as carboxymethyl cellulose or autologous blood clot, to prevent the protein compositions from disassociating from the matrix.

A preferred family of sequestering agents is cellulosic materials such as alkylcelluloses (including hydroxyalkylcelluloses), including methylcellulose, ethylcellulose, hydroxyethylcellulose, hydroxypropylcellulose, hydroxypropyl-methylcellulose, and carboxymethylcellulose, the most preferred being cationic salts of carboxymethylcellulose (CMC). Other preferred sequestering agents include hyaluronic acid, sodium alginate, poly(ethylene glycol), polyoxyethylene oxide, carboxyvinyl polymer and poly(vinyl alcohol). The amount of sequestering agent useful herein is 0.5-20 wt %, preferably 1-10 wt % based on total formulation weight, which represents the amount necessary to prevent desorption of the protein from the polymer matrix and to provide appropriate handling of the composition, yet not so much that the progenitor cells are prevented from infiltrating the matrix, thereby providing the protein the opportunity to assist the osteogenic activity of the progenitor cells. In further compositions, proteins or other active ingredients of the invention may be combined with other agents beneficial to the treatment of the bone and/or cartilage defect, wound, or tissue in question. These agents include various growth factors such as epidermal growth factor (EGF), platelet derived growth factor (PDGF), transforming growth factors (TGF-α and TGF-β), and insulin-like growth factor (IGF).

The therapeutic compositions are also presently valuable for veterinary applications. Particularly domestic animals and thoroughbred horses, in addition to humans, are desired patients for such treatment with proteins or other active ingredients of the present invention. The dosage regimen of a protein-containing pharmaceutical composition to be used in tissue regeneration will be determined by the attending physician considering various factors which modify the action of the proteins, *e.g.,* amount of tissue weight desired to be formed, the site of damage, the condition of the damaged tissue, the size of a wound, type of damaged tissue (*e.g.*, bone), the patient's age, sex, and diet, the severity of any infection, time of administration and other clinical factors. The dosage may vary with the type of matrix used in the reconstitution and with inclusion of other proteins in the pharmaceutical composition. For example, the addition of other known growth factors, such as IGF I (insulin like growth factor I), to the final composition, may also effect the dosage. Progress can be monitored by periodic assessment of tissue/bone growth and/or repair, for example, X-rays, histomorphometric determinations and tetracycline labeling.

Polynucleotides of the present invention can also be used for gene therapy. Such polynucleotides can be introduced either in vivo or ex vivo into cells for expression in a mammalian subject. Polynucleotides of the invention may also be administered by other known methods for introduction of nucleic acid into a cell or organism (including, without limitation, in the form of viral vectors or naked DNA). Cells may also be cultured ex vivo in the presence of proteins of the present invention in order to proliferate or to produce a desired effect on or activity in such cells. Treated cells can then be introduced in vivo for therapeutic purposes.

4.12.3 EFFECTIVE DOSAGE

Pharmaceutical compositions suitable for use in the present invention include compositions wherein the active ingredients are contained in an effective amount to achieve its intended purpose. More specifically, a therapeutically effective amount means an amount effective to prevent development of or to alleviate the existing symptoms of the subject being treated. Determination of the effective amount is well within the capability of those skilled in the art, especially in light of the detailed disclosure provided herein. For any compound used in the method of the invention, the therapeutically effective dose can be estimated initially from appropriate in vitro assays. For example, a dose can be formulated in animal models to achieve a circulating concentration range that can be used to more accurately determine useful doses in humans. For example, a dose can be formulated in animal models to achieve a circulating concentration range that includes the IC_{50} as determined in cell culture (*i.e.*, the concentration of

A therapeutically effective dose refers to that amount of the compound that results in amelioration of symptoms or a prolongation of survival in a patient. Toxicity and therapeutic efficacy of such compounds can be determined by standard pharmaceutical procedures in cell cultures or experimental animals, *e.g.*, for determining the LD_{50} (the dose lethal to 50% of the population) and the ED_{50} (the dose therapeutically effective in 50% of the population). The dose ratio between toxic and therapeutic effects is the therapeutic index and it can be expressed as the ratio between LD_{50} and ED_{50}. Compounds which exhibit high therapeutic indices are preferred. The data obtained from these cell culture assays and animal studies can be used in formulating a range of dosage for use in human. The dosage of such compounds lies preferably within a range of circulating concentrations that include the ED_{50} with little or no toxicity. The dosage may vary within this range depending upon the dosage form employed and the route of administration utilized. The exact formulation, route of administration and dosage can be chosen by the individual physician in view of the patient's condition. See, *e.g.*, Fingl et al., 1975, in "The Pharmacological Basis of Therapeutics", Ch. 1 p.1. Dosage amount and interval may be adjusted individually to provide plasma levels of the active moiety which are sufficient to maintain the desired effects, or minimal effective concentration (MEC). The MEC will vary for each compound but can be estimated from *in vitro* data. Dosages necessary to achieve the MEC will depend on individual characteristics and route of administration. However, HPLC assays or bioassays can be used to determine plasma concentrations.

Dosage intervals can also be determined using MEC value. Compounds should be administered using a regimen that maintains plasma levels above the MEC for 10-90% of the time, preferably between 30-90% and most preferably between 50-90%. In cases of local administration or selective uptake, the effective local concentration of the drug may not be related to plasma concentration.

An exemplary dosage regimen for polypeptides or other compositions of the invention will be in the range of about 0.01 μg/kg to 100 mg/kg of body weight daily, with the preferred dose being about 0.1 μg/kg to 25 mg/kg of patient body weight daily, varying in adults and children. Dosing may be once daily, or equivalent doses may be delivered at longer or shorter intervals.

The amount of composition administered will, of course, be dependent on the subject being treated, on the subject's age and weight, the severity of the affliction, the manner of administration and the judgment of the prescribing physician.

4.12.4 PACKAGING

The compositions may, if desired, be presented in a pack or dispenser device which may contain one or more unit dosage forms containing the active ingredient. The pack may, for example, comprise metal or plastic foil, such as a blister pack. The pack or dispenser device may be accompanied by instructions for administration. Compositions comprising a compound of the invention formulated in a compatible pharmaceutical carrier may also be prepared, placed in an appropriate container, and labeled for treatment of an indicated condition.

4.13 ANTIBODIES

Also included in the invention are antibodies to proteins, or fragments of proteins of the invention. The term "antibody" as used herein refers to immunoglobulin molecules and immunologically active portions of immunoglobulin (Ig) molecules, *i.e.*, molecules that contain an antigen-binding site that specifically binds (immunoreacts with) an antigen. Such antibodies include, but are not limited to, polyclonal, monoclonal, chimeric, single chain, F_{ab}, $F_{ab'}$ and $F_{(ab')2}$ fragments, and an F_{ab} expression library. In general, an antibody molecule obtained from humans relates to any of the classes IgG, IgM, IgA, IgE and IgD, which differ from one another by the nature of the heavy chain present in the molecule. Certain classes have subclasses as well, such as IgG_1, IgG_2, and others. Furthermore, in humans, the light chain may be a kappa chain or a lambda chain. Reference herein to antibodies includes a reference to all such classes, subclasses and types of human antibody species.

An isolated related protein of the invention may be intended to serve as an antigen, or a portion or fragment thereof, and additionally can be used as an immunogen to generate antibodies that immunospecifically bind the antigen, using standard techniques for polyclonal and monoclonal antibody preparation. The full-length protein can be used or, alternatively, the invention provides antigenic peptide fragments of the antigen for use as immunogens. An antigenic peptide fragment comprises at least 6 amino acid residues of the amino acid sequence of any of the full length proteins of the invention, and encompasses an epitope thereof such that an antibody raised against the peptide forms a specific immune complex with the full length protein or with any fragment that contains the epitope. Preferably, the antigenic peptide comprises at least 10 amino acid residues, or at least 15 amino acid residues, or at least 20 amino acid residues, or at least 30 amino acid residues. Preferred epitopes encompassed by the antigenic peptide are regions of the protein that are located on its surface; commonly these are hydrophilic regions.

In certain embodiments of the invention, at least one epitope encompassed by the antigenic peptide is a region on the surface of the protein of the inventiont, *e.g.*, a hydrophilic

region. A hydrophobicity analysis of the human related protein sequence will indicate which regions of a related protein are particularly hydrophilic and, therefore, are likely to encode surface residues useful for targeting antibody production. As a means for targeting antibody production, hydropathy plots showing regions of hydrophilicity and hydrophobicity may be generated by any method well known in the art, including, for example, the Kyte Doolittle or the Hopp Woods methods, either with or without Fourier transformation. See, *e.g.*, Hopp and Woods, 1981, *Proc. Nat. Acad. Sci. USA* 78: 3824-3828; Kyte and Doolittle 1982, *J. Mol. Biol.* 157: 105-142, each of which is incorporated herein by reference in its entirety. Antibodies that are specific for one or more domains within an antigenic protein, or derivatives, fragments, analogs or homologs thereof, are also provided herein.

A protein of the invention, or a derivative, fragment, analog, homolog or ortholog thereof, may be utilized as an immunogen in the generation of antibodies that immunospecifically bind these protein components.

Various procedures known within the art may be used for the production of polyclonal or monoclonal antibodies directed against a protein of the invention, or against derivatives, fragments, analogs homologs or orthologs thereof (see, for example, Antibodies: A Laboratory Manual, Harlow E, and Lane D, 1988, Cold Spring Harbor Laboratory Press, Cold Spring Harbor, NY, incorporated herein by reference). Some of these antibodies are discussed below.

5.13.1 Polyclonal Antibodies

For the production of polyclonal antibodies, various suitable host animals (*e.g.*, rabbit, goat, mouse or other mammal) may be immunized by one or more injections with the native protein, a synthetic variant thereof, or a derivative of the foregoing. An appropriate immunogenic preparation can contain, for example, the naturally occurring immunogenic protein, a chemically synthesized polypeptide representing the immunogenic protein, or a recombinantly expressed immunogenic protein. Furthermore, the protein may be conjugated to a second protein known to be immunogenic in the mammal being immunized. Examples of such immunogenic proteins include but are not limited to keyhole limpet hemocyanin, serum albumin, bovine thyroglobulin, and soybean trypsin inhibitor. The preparation can further include an adjuvant. Various adjuvants used to increase the immunological response include, but are not limited to, Freund's (complete and incomplete), mineral gels (*e.g.*, aluminum hydroxide), surface active substances (*e.g.*, lysolecithin, pluronic polyols, polyanions, peptides, oil emulsions, dinitrophenol, etc.), adjuvants usable in humans such as Bacille Calmette-Guerin and Corynebacterium parvum, or similar immunostimulatory agents. Additional examples of

adjuvants which can be employed include MPL-TDM adjuvant (monophosphoryl Lipid A, synthetic trehalose dicorynomycolate).

The polyclonal antibody molecules directed against the immunogenic protein can be isolated from the mammal (*e.g.*, from the blood) and further purified by well known techniques, such as affinity chromatography using protein A or protein G, which provide primarily the IgG fraction of immune serum. Subsequently, or alternatively, the specific antigen which is the target of the immunoglobulin sought, or an epitope thereof, may be immobilized on a column to purify the immune specific antibody by immunoaffinity chromatography. Purification of immunoglobulins is discussed, for example, by D. Wilkinson (The Scientist, published by The Scientist, Inc., Philadelphia PA, Vol. 14, No. 8 (April 17, 2000), pp. 25-28).

5.13.2 Monoclonal Antibodies

The term "monoclonal antibody" (MAb) or "monoclonal antibody composition", as used herein, refers to a population of antibody molecules that contain only one molecular species of antibody molecule consisting of a unique light chain gene product and a unique heavy chain gene product. In particular, the complementarity determining regions (CDRs) of the monoclonal antibody are identical in all the molecules of the population. MAbs thus contain an antigen-binding site capable of immunoreacting with a particular epitope of the antigen characterized by a unique binding affinity for it.

Monoclonal antibodies can be prepared using hybridoma methods, such as those described by Kohler and Milstein, Nature, 256:495 (1975). In a hybridoma method, a mouse, hamster, or other appropriate host animal, is typically immunized with an immunizing agent to elicit lymphocytes that produce or are capable of producing antibodies that will specifically bind to the immunizing agent. Alternatively, the lymphocytes can be immunized in vitro.

The immunizing agent will typically include the protein antigen, a fragment thereof or a fusion protein thereof. Generally, either peripheral blood lymphocytes are used if cells of human origin are desired, or spleen cells or lymph node cells are used if non-human mammalian sources are desired. The lymphocytes are then fused with an immortalized cell line using a suitable fusing agent, such as polyethylene glycol, to form a hybridoma cell (Goding, Monoclonal Antibodies: Principles and Practice, Academic Press, (1986) pp. 59-103). Immortalized cell lines are usually transformed mammalian cells, particularly myeloma cells of rodent, bovine and human origin. Usually, rat or mouse myeloma cell lines are employed. The hybridoma cells can be cultured in a suitable culture medium that preferably contains one or more substances that inhibit the growth or survival of the unfused, immortalized cells. For example, if the parental cells lack the enzyme hypoxanthine guanine phosphoribosyl transferase (HGPRT or HPRT), the

culture medium for the hybridomas typically will include hypoxanthine, aminopterin, and thymidine ("HAT medium"), which substances prevent the growth of HGPRT-deficient cells.

Preferred immortalized cell lines are those that fuse efficiently, support stable high level expression of antibody by the selected antibody-producing cells, and are sensitive to a medium such as HAT medium. More preferred immortalized cell lines are murine myeloma lines, which can be obtained, for instance, from the Salk Institute Cell Distribution Center, San Diego, California and the American Type Culture Collection, Manassas, Virginia. Human myeloma and mouse-human heteromyeloma cell lines also have been described for the production of human monoclonal antibodies (Kozbor, J. Immunol., 133:3001 (1984); Brodeur et al., Monoclonal Antibody Production Techniques and Applications, Marcel Dekker, Inc., New York, (1987) pp. 51-63).

The culture medium in which the hybridoma cells are cultured can then be assayed for the presence of monoclonal antibodies directed against the antigen. Preferably, the binding specificity of monoclonal antibodies produced by the hybridoma cells is determined by immunoprecipitation or by an in vitro binding assay, such as radioimmunoassay (RIA) or enzyme-linked immunoabsorbent assay (ELISA). Such techniques and assays are known in the art. The binding affinity of the monoclonal antibody can, for example, be determined by the Scatchard analysis of Munson and Pollard, Anal. Biochem., 107:220 (1980). Preferably, antibodies having a high degree of specificity and a high binding affinity for the target antigen are isolated.

After the desired hybridoma cells are identified, the clones can be subcloned by limiting dilution procedures and grown by standard methods. Suitable culture media for this purpose include, for example, Dulbecco's Modified Eagle's Medium and RPMI-1640 medium. Alternatively, the hybridoma cells can be grown in vivo as ascites in a mammal.

The monoclonal antibodies secreted by the subclones can be isolated or purified from the culture medium or ascites fluid by conventional immunoglobulin purification procedures such as, for example, protein A-Sepharose, hydroxylapatite chromatography, gel electrophoresis, dialysis, or affinity chromatography.

The monoclonal antibodies can also be made by recombinant DNA methods, such as those described in U.S. Patent No. 4,816,567. DNA encoding the monoclonal antibodies of the invention can be readily isolated and sequenced using conventional procedures (*e.g.*, by using oligonucleotide probes that are capable of binding specifically to genes encoding the heavy and light chains of murine antibodies). The hybridoma cells of the invention serve as a preferred source of such DNA. Once isolated, the DNA can be placed into expression vectors, which are then transfected into host cells such as simian COS cells, Chinese hamster ovary (CHO) cells, or

myeloma cells that do not otherwise produce immunoglobulin protein, to obtain the synthesis of monoclonal antibodies in the recombinant host cells. The DNA also can be modified, for example, by substituting the coding sequence for human heavy and light chain constant domains in place of the homologous murine sequences (U.S. Patent No. 4,816,567; Morrison, Nature 368, 812-13 (1994)) or by covalently joining to the immunoglobulin coding sequence all or part of the coding sequence for a non-immunoglobulin polypeptide. Such a non-immunoglobulin polypeptide can be substituted for the constant domains of an antibody of the invention, or can be substituted for the variable domains of one antigen-combining site of an antibody of the invention to create a chimeric bivalent antibody.

5.13.2 Humanized Antibodies

The antibodies directed against the protein antigens of the invention can further comprise humanized antibodies or human antibodies. These antibodies are suitable for administration to humans without engendering an immune response by the human against the administered immunoglobulin. Humanized forms of antibodies are chimeric immunoglobulins, immunoglobulin chains or fragments thereof (such as Fv, Fab, Fab', $F(ab')_2$ or other antigen-binding subsequences of antibodies) that are principally comprised of the sequence of a human immunoglobulin, and contain minimal sequence derived from a non-human immunoglobulin. Humanization can be performed following the method of Winter and co-workers (Jones et al., Nature, 321:522-525 (1986); Riechmann et al., Nature, 332:323-327 (1988); Verhoeyen et al., Science, 239:1534-1536 (1988)), by substituting rodent CDRs or CDR sequences for the corresponding sequences of a human antibody. (See also U.S. Patent No. 5,225,539.) In some instances, Fv framework residues of the human immunoglobulin are replaced by corresponding non-human residues. Humanized antibodies can also comprise residues which are found neither in the recipient antibody nor in the imported CDR or framework sequences. In general, the humanized antibody will comprise substantially all of at least one, and typically two, variable domains, in which all or substantially all of the CDR regions correspond to those of a non-human immunoglobulin and all or substantially all of the framework regions are those of a human immunoglobulin consensus sequence. The humanized antibody optimally also will comprise at least a portion of an immunoglobulin constant region (Fc), typically that of a human immunoglobulin (Jones et al., 1986; Riechmann et al., 1988; and Presta, Curr. Op. Struct. Biol., 2:593-596 (1992)).

5.13.3 Human Antibodies

Fully human antibodies relate to antibody molecules in which essentially the entire sequences of both the light chain and the heavy chain, including the CDRs, arise from human genes. Such antibodies are termed "human antibodies", or "fully human antibodies" herein. Human monoclonal antibodies can be prepared by the trioma technique; the human B-cell hybridoma technique (see Kozbor, et al., 1983 Immunol Today 4: 72) and the EBV hybridoma technique to produce human monoclonal antibodies (see Cole, et al., 1985 In: MONOCLONAL ANTIBODIES AND CANCER THERAPY, Alan R. Liss, Inc., pp. 77-96). Human monoclonal antibodies may be utilized in the practice of the present invention and may be produced by using human hybridomas (see Cote, et al., 1983. Proc Natl Acad Sci USA 80: 2026-2030) or by transforming human B-cells with Epstein Barr Virus in vitro (see Cole, et al., 1985 In: MONOCLONAL ANTIBODIES AND CANCER THERAPY, Alan R. Liss, Inc., pp. 77-96).

In addition, human antibodies can also be produced using additional techniques, including phage display libraries (Hoogenboom and Winter, J. Mol. Biol., 227:381 (1991); Marks et al., J. Mol. Biol., 222:581 (1991)). Similarly, human antibodies can be made by introducing human immunoglobulin loci into transgenic animals, *e.g.*, mice in which the endogenous immunoglobulin genes have been partially or completely inactivated. Upon challenge, human antibody production is observed, which closely resembles that seen in humans in all respects, including gene rearrangement, assembly, and antibody repertoire. This approach is described, for example, in U.S. Patent Nos. 5,545,807; 5,545,806; 5,569,825; 5,625,126; 5,633,425; 5,661,016, and in Marks et al. (Bio/Technology 10, 779-783 (1992)); Lonberg et al. (Nature 368 856-859 (1994)); Morrison (Nature 368, 812-13 (1994)); Fishwild et al,(Nature Biotechnology 14, 845-51 (1996)); Neuberger (Nature Biotechnology 14, 826 (1996)); and Lonberg and Huszar (Intern. Rev. Immunol. 13 65-93 (1995)).

Human antibodies may additionally be produced using transgenic nonhuman animals which are modified so as to produce fully human antibodies rather than the animal's endogenous antibodies in response to challenge by an antigen. (See PCT publication WO94/02602). The endogenous genes encoding the heavy and light immunoglobulin chains in the nonhuman host have been incapacitated, and active loci encoding human heavy and light chain immunoglobulins are inserted into the host's genome. The human genes are incorporated, for example, using yeast artificial chromosomes containing the requisite human DNA segments. An animal which provides all the desired modifications is then obtained as progeny by crossbreeding intermediate transgenic animals containing fewer than the full complement of the modifications. The preferred embodiment of such a nonhuman animal is a mouse, and is termed the Xenomouse™ as disclosed in PCT publications WO 96/33735 and WO 96/34096. This animal produces B cells which secrete fully human immunoglobulins. The antibodies can be obtained directly from

the animal after immunization with an immunogen of interest, as, for example, a preparation of a polyclonal antibody, or alternatively from immortalized B cells derived from the animal, such as hybridomas producing monoclonal antibodies. Additionally, the genes encoding the immunoglobulins with human variable regions can be recovered and expressed to obtain the antibodies directly, or can be further modified to obtain analogs of antibodies such as, for example, single chain Fv molecules.

An example of a method of producing a nonhuman host, exemplified as a mouse, lacking expression of an endogenous immunoglobulin heavy chain is disclosed in U.S. Patent No. 5,939,598. It can be obtained by a method including deleting the J segment genes from at least one endogenous heavy chain locus in an embryonic stem cell to prevent rearrangement of the locus and to prevent formation of a transcript of a rearranged immunoglobulin heavy chain locus, the deletion being effected by a targeting vector containing a gene encoding a selectable marker; and producing from the embryonic stem cell a transgenic mouse whose somatic and germ cells contain the gene encoding the selectable marker.

A method for producing an antibody of interest, such as a human antibody, is disclosed in U.S. Patent No. 5,916,771. It includes introducing an expression vector that contains a nucleotide sequence encoding a heavy chain into one mammalian host cell in culture, introducing an expression vector containing a nucleotide sequence encoding a light chain into another mammalian host cell, and fusing the two cells to form a hybrid cell. The hybrid cell expresses an antibody containing the heavy chain and the light chain.

In a further improvement on this procedure, a method for identifying a clinically relevant epitope on an immunogen, and a correlative method for selecting an antibody that binds immunospecifically to the relevant epitope with high affinity, are disclosed in PCT publication WO 99/53049.

5.13.4 F_{ab} Fragments and Single Chain Antibodies

According to the invention, techniques can be adapted for the production of single-chain antibodies specific to an antigenic protein of the invention (see *e.g.*, U.S. Patent No. 4,946,778). In addition, methods can be adapted for the construction of F_{ab} expression libraries (see *e.g.*, Huse, et al., 1989 Science 246: 1275-1281) to allow rapid and effective identification of monoclonal F_{ab} fragments with the desired specificity for a protein or derivatives, fragments, analogs or homologs thereof. Antibody fragments that contain the idiotypes to a protein antigen may be produced by techniques known in the art including, but not limited to: (i) an $F_{(ab')2}$ fragment produced by pepsin digestion of an antibody molecule; (ii) an F_{ab} fragment generated

by reducing the disulfide bridges of an $F_{(ab')2}$ fragment; (iii) an F_{ab} fragment generated by the treatment of the antibody molecule with papain and a reducing agent and (iv) F_v fragments.

5.13.5 Bispecific Antibodies

Bispecific antibodies are monoclonal, preferably human or humanized, antibodies that have binding specificities for at least two different antigens. In the present case, one of the binding specificities is for an antigenic protein of the invention. The second binding target is any other antigen, and advantageously is a cell-surface protein or receptor or receptor subunit.

Methods for making bispecific antibodies are known in the art. Traditionally, the recombinant production of bispecific antibodies is based on the co-expression of two immunoglobulin heavy-chain/light-chain pairs, where the two heavy chains have different specificities (Milstein and Cuello, Nature, 305:537-539 (1983)). Because of the random assortment of immunoglobulin heavy and light chains, these hybridomas (quadromas) produce a potential mixture of ten different antibody molecules, of which only one has the correct bispecific structure. The purification of the correct molecule is usually accomplished by affinity chromatography steps. Similar procedures are disclosed in WO 93/08829, published 13 May 1993, and in Traunecker *et al.*, 1991 *EMBO J.*, 10:3655-3659.

Antibody variable domains with the desired binding specificities (antibody-antigen combining sites) can be fused to immunoglobulin constant domain sequences. The fusion preferably is with an immunoglobulin heavy-chain constant domain, comprising at least part of the hinge, CH2, and CH3 regions. It is preferred to have the first heavy-chain constant region (CH1) containing the site necessary for light-chain binding present in at least one of the fusions. DNAs encoding the immunoglobulin heavy-chain fusions and, if desired, the immunoglobulin light chain, are inserted into separate expression vectors, and are co-transfected into a suitable host organism. For further details of generating bispecific antibodies see, for example, Suresh et al., Methods in Enzymology, 121:210 (1986).

According to another approach described in WO 96/27011, the interface between a pair of antibody molecules can be engineered to maximize the percentage of heterodimers which are recovered from recombinant cell culture. The preferred interface comprises at least a part of the CH3 region of an antibody constant domain. In this method, one or more small amino acid side chains from the interface of the first antibody molecule are replaced with larger side chains (*e.g.* tyrosine or tryptophan). Compensatory "cavities" of identical or similar size to the large side chain(s) are created on the interface of the second antibody molecule by replacing large amino acid side chains with smaller ones (*e.g.* alanine or threonine). This provides a mechanism for increasing the yield of the heterodimer over other unwanted end-products such as homodimers.

Bispecific antibodies can be prepared as full length antibodies or antibody fragments (*e.g.* $F(ab')_2$ bispecific antibodies). Techniques for generating bispecific antibodies from antibody fragments have been described in the literature. For example, bispecific antibodies can be prepared using chemical linkage. Brennan et al., Science 229:81 (1985) describe a procedure wherein intact antibodies are proteolytically cleaved to generate $F(ab')_2$ fragments. These fragments are reduced in the presence of the dithiol complexing agent sodium arsenite to stabilize vicinal dithiols and prevent intermolecular disulfide formation. The Fab' fragments generated are then converted to thionitrobenzoate (TNB) derivatives. One of the Fab'-TNB derivatives is then reconverted to the Fab'-thiol by reduction with mercaptoethylamine and is mixed with an equimolar amount of the other Fab'-TNB derivative to form the bispecific antibody. The bispecific antibodies produced can be used as agents for the selective immobilization of enzymes.

Additionally, Fab' fragments can be directly recovered from E. coli and chemically coupled to form bispecific antibodies. Shalaby et al., J. Exp. Med. 175:217-225 (1992) describe the production of a fully humanized bispecific antibody $F(ab')_2$ molecule. Each Fab' fragment was separately secreted from E. coli and subjected to directed chemical coupling in vitro to form the bispecific antibody. The bispecific antibody thus formed was able to bind to cells overexpressing the ErbB2 receptor and normal human T cells, as well as trigger the lytic activity of human cytotoxic lymphocytes against human breast tumor targets.

Various techniques for making and isolating bispecific antibody fragments directly from recombinant cell culture have also been described. For example, bispecific antibodies have been produced using leucine zippers. Kostelny et al., J. Immunol. 148(5):1547-1553 (1992). The leucine zipper peptides from the Fos and Jun proteins were linked to the Fab' portions of two different antibodies by gene fusion. The antibody homodimers were reduced at the hinge region to form monomers and then re-oxidized to form the antibody heterodimers. This method can also be utilized for the production of antibody homodimers. The "diabody" technology described by Hollinger et al., Proc. Natl. Acad. Sci. USA 90:6444-6448 (1993) has provided an alternative mechanism for making bispecific antibody fragments. The fragments comprise a heavy-chain variable domain (V_H) connected to a light-chain variable domain (V_L) by a linker which is too short to allow pairing between the two domains on the same chain. Accordingly, the V_H and V_L domains of one fragment are forced to pair with the complementary V_L and V_H domains of another fragment, thereby forming two antigen-binding sites. Another strategy for making bispecific antibody fragments by the use of single-chain Fv (sFv) dimers has also been reported. See, Gruber et al., J. Immunol. 152:5368 (1994).

Antibodies with more than two valencies are contemplated. For example, trispecific antibodies can be prepared. Tutt et al., J. Immunol. 147:60 (1991).

Exemplary bispecific antibodies can bind to two different epitopes, at least one of which originates in the protein antigen of the invention. Alternatively, an anti-antigenic arm of an immunoglobulin molecule can be combined with an arm which binds to a triggering molecule on a leukocyte such as a T-cell receptor molecule (*e.g.* CD2, CD3, CD28, or B7), or Fc receptors for IgG (FcγR), such as FcγRI (CD64), FcγRII (CD32) and FcγRIII (CD16) so as to focus cellular defense mechanisms to the cell expressing the particular antigen. Bispecific antibodies can also be used to direct cytotoxic agents to cells which express a particular antigen. These antibodies possess an antigen-binding arm and an arm which binds a cytotoxic agent or a radionuclide chelator, such as EOTUBE, DPTA, DOTA, or TETA. Another bispecific antibody of interest binds the protein antigen described herein and further binds tissue factor (TF).

5.13.6 Heteroconjugate Antibodies

Heteroconjugate antibodies are also within the scope of the present invention. Heteroconjugate antibodies are composed of two covalently joined antibodies. Such antibodies have, for example, been proposed to target immune system cells to unwanted cells (U.S. Patent No. 4,676,980), and for treatment of HIV infection (WO 91/00360; WO 92/200373; EP 03089). It is contemplated that the antibodies can be prepared in vitro using known methods in synthetic protein chemistry, including those involving crosslinking agents. For example, immunotoxins can be constructed using a disulfide exchange reaction or by forming a thioether bond. Examples of suitable reagents for this purpose include iminothiolate and methyl-4-mercaptobutyrimidate and those disclosed, for example, in U.S. Patent No. 4,676,980.

5.13.7 Effector Function Engineering

It can be desirable to modify the antibody of the invention with respect to effector function, so as to enhance, *e.g.*, the effectiveness of the antibody in treating cancer. For example, cysteine residue(s) can be introduced into the Fc region, thereby allowing interchain disulfide bond formation in this region. The homodimeric antibody thus generated can have improved internalization capability and/or increased complement-mediated cell killing and antibody-dependent cellular cytotoxicity (ADCC). See Caron et al., J. Exp Med., 176: 1191-1195 (1992) and Shopes, J. Immunol., 148: 2918-2922 (1992). Homodimeric antibodies with enhanced anti-tumor activity can also be prepared using heterobifunctional cross-linkers as described in Wolff et al. Cancer Research, 53: 2560-2565 (1993). Alternatively, an antibody can

be engineered that has dual Fc regions and can thereby have enhanced complement lysis and ADCC capabilities. See Stevenson et al., Anti-Cancer Drug Design, 3: 219-230 (1989).

5.13.8 Immunoconjugates

The invention also pertains to immunoconjugates comprising an antibody conjugated to a cytotoxic agent such as a chemotherapeutic agent, toxin (*e.g.*, an enzymatically active toxin of bacterial, fungal, plant, or animal origin, or fragments thereof), or a radioactive isotope (*i.e.*, a radioconjugate).

Chemotherapeutic agents useful in the generation of such immunoconjugates have been described above. Enzymatically active toxins and fragments thereof that can be used include diphtheria A chain, nonbinding active fragments of diphtheria toxin, exotoxin A chain (from Pseudomonas aeruginosa), ricin A chain, abrin A chain, modeccin A chain, alpha-sarcin, Aleurites fordii proteins, dianthin proteins, Phytolaca americana proteins (PAPI, PAPII, and PAP-S), momordica charantia inhibitor, curcin, crotin, sapaonaria officinalis inhibitor, gelonin, mitogellin, restrictocin, phenomycin, enomycin, and the tricothecenes. A variety of radionuclides are available for the production of radioconjugated antibodies. Examples include ^{212}Bi, ^{131}I, ^{131}In, ^{90}Y, and ^{186}Re.

Conjugates of the antibody and cytotoxic agent are made using a variety of bifunctional protein-coupling agents such as N-succinimidyl-3-(2-pyridyldithiol) propionate (SPDP), iminothiolane (IT), bifunctional derivatives of imidoesters (such as dimethyl adipimidate HCL), active esters (such as disuccinimidyl suberate), aldehydes (such as glutareldehyde), bis-azido compounds (such as bis (p-azidobenzoyl) hexanediamine), bis-diazonium derivatives (such as bis-(p-diazoniumbenzoyl)-ethylenediamine), diisocyanates (such as tolyene 2,6-diisocyanate), and bis-active fluorine compounds (such as 1,5-difluoro-2,4-dinitrobenzene). For example, a ricin immunotoxin can be prepared as described in Vitetta et al., Science, 238: 1098 (1987). Carbon-14-labeled 1-isothiocyanatobenzyl-3-methyldiethylene triaminepentaacetic acid (MX-DTPA) is an exemplary chelating agent for conjugation of radionucleotide to the antibody. See WO94/11026.

In another embodiment, the antibody can be conjugated to a "receptor" (such streptavidin) for utilization in tumor pretargeting wherein the antibody-receptor conjugate is administered to the patient, followed by removal of unbound conjugate from the circulation using a clearing agent and then administration of a "ligand" (*e.g.*, avidin) that is in turn conjugated to a cytotoxic agent.

4.14 COMPUTER READABLE SEQUENCES

In one application of this embodiment, a nucleotide sequence of the present invention can be recorded on computer readable media. As used herein, "computer readable media" refers to any medium which can be read and accessed directly by a computer. Such media include, but are not limited to: magnetic storage media, such as floppy discs, hard disc storage medium, and magnetic tape; optical storage media such as CD-ROM; electrical storage media such as RAM and ROM; and hybrids of these categories such as magnetic/optical storage media. A skilled artisan can readily appreciate how any of the presently known computer readable mediums can be used to create a manufacture comprising computer readable medium having recorded thereon a nucleotide sequence of the present invention. As used herein, "recorded" refers to a process for storing information on computer readable medium. A skilled artisan can readily adopt any of the presently known methods for recording information on computer readable medium to generate manufactures comprising the nucleotide sequence information of the present invention.

A variety of data storage structures are available to a skilled artisan for creating a computer readable medium having recorded thereon a nucleotide sequence of the present invention. The choice of the data storage structure will generally be based on the means chosen to access the stored information. In addition, a variety of data processor programs and formats can be used to store the nucleotide sequence information of the present invention on computer readable medium. The sequence information can be represented in a word processing text file, formatted in commercially-available software such as WordPerfect and Microsoft Word, or represented in the form of an ASCII file, stored in a database application, such as DB2, Sybase, Oracle, or the like. A skilled artisan can readily adapt any number of data processor structuring formats (*e.g.* text file or database) in order to obtain computer readable medium having recorded thereon the nucleotide sequence information of the present invention.

By providing any of the nucleotide sequences SEQ ID NO: 1-8051 or a representative fragment thereof; or a nucleotide sequence at least 95% identical to any of the nucleotide sequences of SEQ ID NO: 1-8051 in computer readable form, a skilled artisan can routinely access the sequence information for a variety of purposes. Computer software is publicly available which allows a skilled artisan to access sequence information provided in a computer readable medium. The examples which follow demonstrate how software which implements the BLAST (Altschul et al., J. Mol. Biol. 215:403-410 (1990)) and BLAZE (Brutlag et al., Comp. Chem. 17:203-207 (1993)) search algorithms on a Sybase system is used to identify open reading frames (ORFs) within a nucleic acid sequence. Such ORFs may be protein encoding fragments and may be useful in producing commercially important proteins such as enzymes used in fermentation reactions and in the production of commercially useful metabolites.

As used herein, "a computer-based system" refers to the hardware means, software means, and data storage means used to analyze the nucleotide sequence information of the present invention. The minimum hardware means of the computer-based systems of the present invention comprises a central processing unit (CPU), input means, output means, and data storage means. A skilled artisan can readily appreciate that any one of the currently available computer-based systems are suitable for use in the present invention. As stated above, the computer-based systems of the present invention comprise a data storage means having stored therein a nucleotide sequence of the present invention and the necessary hardware means and software means for supporting and implementing a search means. As used herein, "data storage means" refers to memory which can store nucleotide sequence information of the present invention, or a memory access means which can access manufactures having recorded thereon the nucleotide sequence information of the present invention.

As used herein, "search means" refers to one or more programs which are implemented on the computer-based system to compare a target sequence or target structural motif with the sequence information stored within the data storage means. Search means are used to identify fragments or regions of a known sequence which match a particular target sequence or target motif. A variety of known algorithms are disclosed publicly and a variety of commercially available software for conducting search means are and can be used in the computer-based systems of the present invention. Examples of such software includes, but is not limited to, Smith-Waterman, MacPattern (EMBL), BLASTN and BLASTA (NPOLYPEPTIDEIA). A skilled artisan can readily recognize that any one of the available algorithms or implementing software packages for conducting homology searches can be adapted for use in the present computer-based systems. As used herein, a "target sequence" can be any nucleic acid or amino acid sequence of six or more nucleotides or two or more amino acids. A skilled artisan can readily recognize that the longer a target sequence is, the less likely a target sequence will be present as a random occurrence in the database. The most preferred sequence length of a target sequence is from about 10 to 300 amino acids, more preferably from about 30 to 100 nucleotide residues. However, it is well recognized that searches for commercially important fragments, such as sequence fragments involved in gene expression and protein processing, may be of shorter length.

As used herein, "a target structural motif," or "target motif," refers to any rationally selected sequence or combination of sequences in which the sequence(s) are chosen based on a three-dimensional configuration which is formed upon the folding of the target motif. There are a variety of target motifs known in the art. Protein target motifs include, but are not limited to, enzyme active sites and signal sequences. Nucleic acid target motifs include, but are not limited

to, promoter sequences, hairpin structures and inducible expression elements (protein binding sequenees).

4.15 TRIPLE HELIX FORMATION

In addition, the fragments of the present invention, as broadly described, can be used to control gene expression through triple helix formation or antisense DNA or RNA, both of which methods are based on the binding of a polynucleotide sequence to DNA or RNA. Polynucleotides suitable for use in these methods are preferably 20 to 40 bases in length and are designed to be complementary to a region of the gene involved in transcription (triple helix - see Lee et al., Nucl. Acids Res. 6:3073 (1979); Cooney et al., Science 15241:456 (1988); and Dervan et al., Science 251:1360 (1991)) or to the mRNA itself (antisense - Olmno, J. Neurochem. 56:560 (1991); Oligodeoxynucleotides as Antisense Inhibitors of Gene Expression, CRC Press, Boca Raton, FL (1988)). Triple helix-formation optimally results in a shut-off of RNA transcription from DNA, while antisense RNA hybridization blocks translation of an mRNA molecule into polypeptide. Both techniques have been demonstrated to be effective in model systems. Information contained in the sequences of the present invention is necessary for the design of an antisense or triple helix oligonucleotide.

4.16 DIAGNOSTIC ASSAYS AND KITS

The present invention further provides methods to identify the presence or expression of one of the ORFs of the present invention, or homolog thereof, in a test sample, using a nucleic acid probe or antibodies of the present invention, optionally conjugated or otherwise associated with a suitable label.

In general, methods for detecting a polynucleotide of the invention can comprise contacting a sample with a compound that binds to and forms a complex with the polynucleotide for a period sufficient to form the complex, and detecting the complex, so that if a complex is detected, a polynucleotide of the invention is detected in the sample. Such methods can also comprise contacting a sample under stringent hybridization conditions with nucleic acid primers that anneal to a polynucleotide of the invention under such conditions, and amplifying annealed polynucleotides, so that if a polynucleotide is amplified, a polynucleotide of the invention is detected in the sample.

In general, methods for detecting a polypeptide of the invention can comprise contacting a sample with a compound that binds to and forms a complex with the polypeptide for a period sufficient to form the complex, and detecting the complex, so that if a complex is detected, a polypeptide of the invention is detected in the sample.

In detail, such methods comprise incubating a test sample with one or more of the antibodies or one or more of the nucleic acid probes of the present invention and assaying for binding of the nucleic acid probes or antibodies to components within the test sample.

Conditions for incubating a nucleic acid probe or antibody with a test sample vary. Incubation conditions depend on the format employed in the assay, the detection methods employed, and the type and nature of the nucleic acid probe or antibody used in the assay. One skilled in the art will recognize that any one of the commonly available hybridization, amplification or immunological assay formats can readily be adapted to employ the nucleic acid probes or antibodies of the present invention. Examples of such assays can be found in Chard, T., An Introduction to Radioimmunoassay and Related Techniques, Elsevier Science Publishers, Amsterdam, The Netherlands (1986); Bullock, G.R. et al., Techniques in Immunocytochemistry, Academic Press, Orlando, FL Vol. 1 (1982), Vol. 2 (1983), Vol. 3 (1985); Tijssen, P., Practice and Theory of immunoassays: Laboratory Techniques in Biochemistry and Molecular Biology, Elsevier Science Publishers, Amsterdam, The Netherlands (1985). The test samples of the present invention include cells, protein or membrane extracts of cells, or biological fluids such as sputum, blood, serum, plasma, or urine. The test sample used in the above-described method will vary based on the assay format, nature of the detection method and the tissues, cells or extracts used as the sample to be assayed. Methods for preparing protein extracts or membrane extracts of cells are well known in the art and can be readily be adapted in order to obtain a sample which is compatible with the system utilized.

In another embodiment of the present invention, kits are provided which contain the necessary reagents to carry out the assays of the present invention. Specifically, the invention provides a compartment kit to receive, in close confinement, one or more containers which comprises: (a) a first container comprising one of the probes or antibodies of the present invention; and (b) one or more other containers comprising one or more of the following: wash reagents, reagents capable of detecting presence of a bound probe or antibody.

In detail, a compartment kit includes any kit in which reagents are contained in separate containers. Such containers include small glass containers, plastic containers or strips of plastic or paper. Such containers allows one to efficiently transfer reagents from one compartment to another compartment such that the samples and reagents are not cross-contaminated, and the agents or solutions of each container can be added in a quantitative fashion from one compartment to another. Such containers will include a container which will accept the test sample, a container which contains the antibodies used in the assay, containers which contain wash reagents (such as phosphate buffered saline, Tris-buffers, etc.), and containers which contain the reagents used to detect the bound antibody or probe. Types of detection reagents

include labeled nucleic acid probes, labeled secondary antibodies, or in the alternative, if the primary antibody is labeled, the enzymatic, or antibody binding reagents which are capable of reacting with the labeled antibody. One skilled in the art will readily recognize that the disclosed probes and antibodies of the present invention can be readily incorporated into one of the established kit formats which are well known in the art.

4.17 MEDICAL IMAGING

The novel polypeptides and binding partners of the invention are useful in medical imaging of sites expressing the molecules of the invention (*e.g.*, where the polypeptide of the invention is involved in the immune response, for imaging sites of inflammation or infection). See, *e.g.*, Kunkel et al., U.S. Pat. NO. 5,413,778. Such methods involve chemical attachment of a labeling or imaging agent, administration of the labeled polypeptide to a subject in a pharmaceutically acceptable carrier, and imaging the labeled polypeptide *in vivo* at the target site.

4.18 SCREENING ASSAYS

Using the isolated proteins and polynucleotides of the invention, the present invention further provides methods of obtaining and identifying agents which bind to a polypeptide encoded by an ORF corresponding to any of the nucleotide sequences set forth in SEQ ID NO: 1-8051, or bind to a specific domain of the polypeptide encoded by the nucleic acid. In detail, said method comprises the steps of:

(a) contacting an agent with an isolated protein encoded by an ORF of the present invention, or nucleic acid of the invention; and

(b) determining whether the agent binds to said protein or said nucleic acid.

In general, therefore, such methods for identifying compounds that bind to a polynucleotide of the invention can comprise contacting a compound with a polynucleotide of the invention for a time sufficient to form a polynucleotide/compound complex, and detecting the complex, so that if a polynucleotide/compound complex is detected, a compound that binds to a polynucleotide of the invention is identified.

Likewise, in general, therefore, such methods for identifying compounds that bind to a polypeptide of the invention can comprise contacting a compound with a polypeptide of the invention for a time sufficient to form a polypeptide/compound complex, and detecting the complex, so that if a polypeptide/compound complex is detected, a compound that binds to a polynucleotide of the invention is identified.

Methods for identifying compounds that bind to a polypeptide of the invention can also comprise contacting a compound with a polypeptide of the invention in a cell for a time sufficient to form a polypeptide/compound complex, wherein the complex drives expression of a receptor gene sequence in the cell, and detecting the complex by detecting reporter gene sequence expression, so that if a polypeptide/compound complex is detected, a compound that binds a polypeptide of the invention is identified.

Compounds identified via such methods can include compounds which modulate the activity of a polypeptide of the invention (that is, increase or decrease its activity, relative to activity observed in the absence of the compound). Alternatively, compounds identified via such methods can include compounds which modulate the expression of a polynucleotide of the invention (that is, increase or decrease expression relative to expression levels observed in the absence of the compound). Compounds, such as compounds identified via the methods of the invention, can be tested using standard assays well known to those of skill in the art for their ability to modulate activity/expression.

The agents screened in the above assay can be, but are not limited to, peptides, carbohydrates, vitamin derivatives, or other pharmaceutical agents. The agents can be selected and screened at random or rationally selected or designed using protein modeling techniques.

For random screening, agents such as peptides, carbohydrates, pharmaceutical agents and the like are selected at random and are assayed for their ability to bind to the protein encoded by the ORF of the present invention. Alternatively, agents may be rationally selected or designed. As used herein, an agent is said to be "rationally selected or designed" when the agent is chosen based on the configuration of the particular protein. For example, one skilled in the art can readily adapt currently available procedures to generate peptides, pharmaceutical agents and the like, capable of binding to a specific peptide sequence, in order to generate rationally designed antipeptide peptides, for example see Hurby et al., Application of Synthetic Peptides: Antisense Peptides," In Synthetic Peptides, A User's Guide, W.H. Freeman, NY (1992), pp. 289-307, and Kaspczak et al., Biochemistry 28:9230-8 (1989), or pharmaceutical agents, or the like.

In addition to the foregoing, one class of agents of the present invention, as broadly described, can be used to control gene expression through binding to one of the ORFs or EMFs of the present invention. As described above, such agents can be randomly screened or rationally designed/selected. Targeting the ORF or EMF allows a skilled artisan to design sequence specific or element specific agents, modulating the expression of either a single ORF or multiple ORFs which rely on the same EMF for expression control. One class of DNA binding agents are agents which contain base residues which hybridize or form a triple helix formation by binding to DNA or RNA. Such agents can be based on the classic phosphodiester,

ribonucleic acid backbone, or can be a variety of sulfhydryl or polymeric derivatives which have base attachment capacity.

Agents suitable for use in these methods preferably contain 20 to 40 bases and are designed to be complementary to a region of the gene involved in transcription (triple helix - see Lee et al., Nucl. Acids Res. 6:3073 (1979); Cooney et al., Science 241:456 (1988); and Dervan et al., Science 251:1360 (1991)) or to the mRNA itself (antisense - Okano, J. Neurochem. 56:560 (1991); Oligodeoxynucleotides as Antisense Inhibitors of Gene Expression, CRC Press, Boca Raton, FL (1988)). Triple helix-formation optimally results in a shut-off of RNA transcription from DNA, while antisense RNA hybridization blocks translation of an mRNA molecule into polypeptide. Both techniques have been demonstrated to be effective in model systems. Information contained in the sequences of the present invention is necessary for the design of an antisense or triple helix oligonucleotide and other DNA binding agents.

Agents that bind to a protein encoded by one of the ORFs of the present invention can be used as a diagnostic agent. Agents which bind to a protein encoded by one of the ORFs of the present invention can be formulated using known techniques to generate a pharmaceutical composition.

4.19 USE OF NUCLEIC ACIDS AS PROBES

Another aspect of the subject invention is to provide for polypeptide-specific nucleic acid hybridization probes capable of hybridizing with naturally occurring nucleotide sequences. The hybridization probes of the subject invention may be derived from any of the nucleotide sequences SEQ ID NO: 1-8051. Because the corresponding gene is only expressed in a limited number of tissues, a hybridization probe derived from of any of the nucleotide sequences SEQ ID NO: 1-8051 can be used as an indicator of the presence of RNA of cell type of such a tissue in a sample.

Any suitable hybridization technique can be employed, such as, for example, in situ hybridization. PCR as described in US Patents Nos. 4,683,195 and 4,965,188 provides additional uses for oligonucleotides based upon the nucleotide sequences. Such probes used in PCR may be of recombinant origin, may be chemically synthesized, or a mixture of both. The probe will comprise a discrete nucleotide sequence for the detection of identical sequences or a degenerate pool of possible sequences for identification of closely related genomic sequences.

Other means for producing specific hybridization probes for nucleic acids include the cloning of nucleic acid sequences into vectors for the production of mRNA probes. Such vectors are known in the art and are commercially available and may be used to synthesize RNA probes *in vitro* by means of the addition of the appropriate RNA polymerase as T7 or SP6 RNA

polymerase and the appropriate radioactively labeled nucleotides. The nucleotide sequences may be used to construct hybridization probes for mapping their respective genomic sequences. The nucleotide sequence provided herein may be mapped to a chromosome or specific regions of a chromosome using well known genetic and/or chromosomal mapping techniques. These techniques include in situ hybridization, linkage analysis against known chromosomal markers, hybridization screening with libraries or flow-sorted chromosomal preparations specific to known chromosomes, and the like. The technique of fluorescent in situ hybridization of chromosome spreads has been described, among other places, in Verma et al (1988) Human Chromosomes: A Manual of Basic Techniques, Pergamon Press, New York NY.

Fluorescent *in situ* hybridization of chromosomal preparations and other physical chromosome mapping techniques may be correlated with additional genetic map data. Examples of genetic map data can be found in the 1994 Genome Issue of Science (265:1981f). Correlation between the location of a nucleic acid on a physical chromosomal map and a specific disease (or predisposition to a specific disease) may help delimit the region of DNA associated with that genetic disease. The nucleotide sequences of the subject invention may be used to detect differences in gene sequences between normal, carrier or affected individuals.

4.20 PREPARATION OF SUPPORT BOUND OLIGONUCLEOTIDES

Oligonucleotides, *i.e.*, small nucleic acid segments, may be readily prepared by, for example, directly synthesizing the oligonucleotide by chemical means, as is commonly practiced using an automated oligonucleotide synthesizer.

Support bound oligonucleotides may be prepared by any of the methods known to those of skill in the art using any suitable support such as glass, polystyrene or Teflon. One strategy is to precisely spot oligonucleotides synthesized by standard synthesizers. Immobilization can be achieved using passive adsorption (Inouye & Hondo, (1990) J. Clin. Microbiol. 28(6) 1469-72); using UV light (Nagata *et al.*, 1985; Dahlen *et al.*, 1987; Morrissey & Collins, (1989) Mol. Cell Probes 3(2) 189-207) or by covalent binding of base modified DNA (Keller *et al.*, 1988; 1989); all references being specifically incorporated herein.

Another strategy that may be employed is the use of the strong biotin-streptavidin interaction as a linker. For example, Broude *et al.* (1994) Proc. Natl. Acad. Sci. USA 91(8) 3072-6, describe the use of biotinylated probes, although these are duplex probes, that are immobilized on streptavidin-coated magnetic beads. Streptavidin-coated beads may be purchased from Dynal, Oslo. Of course, this same linking chemistry is applicable to coating any surface with streptavidin. Biotinylated probes may be purchased from various sources, such as, *e.g.*, Operon Technologies (Alameda, CA).

Nunc Laboratories (Naperville, IL) is also selling suitable material that could be used. Nunc Laboratories have developed a method by which DNA can be covalently bound to the microwell surface termed Covalink NH. CovaLink NH is a polystyrene surface grafted with secondary amino groups (>NH) that serve as bridge-heads for further covalent coupling. CovaLink Modules may be purchased from Nunc Laboratories. DNA molecules may be bound to CovaLink exclusively at the 5'-end by a phosphoramidate bond, allowing immobilization of more than 1 pmol of DNA (Rasmussen *et al.,* (1991) Anal. Biochem. 198(1) 138-42).

The use of CovaLink NH strips for covalent binding of DNA molecules at the 5'-end has been described (Rasmussen et al., (1991). In this technology, a phosphoramidate bond is employed (Chu et al., (1983) Nucleic Acids Res. 11(8) 6513-29). This is beneficial as immobilization using only a single covalent bond is preferred. The phosphoramidate bond joins the DNA to the CovaLink NH secondary amino groups that are positioned at the end of spacer arms covalently grafted onto the polystyrene surface through a 2 nm long spacer arm. To link an oligonucleotide to CovaLink NH via an phosphoramidate bond, the oligonucleotide terminus must have a 5'-end phosphate group. It is, perhaps, even possible for biotin to be covalently bound to CovaLink and then streptavidin used to bind the probes.

More specifically, the linkage method includes dissolving DNA in water (7.5 ng/ul) and denaturing for 10 min. at 95°C and cooling on ice for 10 min. Ice-cold 0.1 M 1-methylimidazole, pH 7.0 (1-MeIm$_7$), is then added to a final concentration of 10 mM 1-MeIm$_7$. A ss DNA solution is then dispensed into CovaLink NH strips (75 ul/well) standing on ice.

Carbodiimide 0.2 M 1-ethyl-3-(3-dimethylaminopropyl)-carbodiimide (EDC), dissolved in 10 mM 1-MeIm$_7$, is made fresh and 25 ul added per well. The strips are incubated for 5 hours at 50°C. After incubation the strips are washed using, *e.g.*, Nunc-Immuno Wash; first the wells are washed 3 times, then they are soaked with washing solution for 5 min., and finally they are washed 3 times (where in the washing solution is 0.4 N NaOH, 0.25% SDS heated to 50°C).

It is contemplated that a further suitable method for use with the present invention is that described in PCT Patent Application WO 90/03382 (Southern & Maskos), incorporated herein by reference. This method of preparing an oligonucleotide bound to a support involves attaching a nucleoside 3'-reagent through the phosphate group by a covalent phosphodiester link to aliphatic hydroxyl groups carried by the support. The oligonucleotide is then synthesized on the supported nucleoside and protecting groups removed from the synthetic oligonucleotide chain under standard conditions that do not cleave the oligonucleotide from the support. Suitable reagents include nucleoside phosphoramidite and nucleoside hydrogen phosphorate.

An on-chip strategy for the preparation of DNA probe for the preparation of DNA probe arrays may be employed. For example, addressable laser-activated photodeprotection may be

Fodor *et al.* (1991) Science 251(4995) 767-73, incorporated herein by reference. Probes may also be immobilized on nylon supports as described by Van Ness *et al.* (1991) Nucleic Acids Res. 19(12) 3345-50; or linked to Teflon using the method of Duncan & Cavalier (1988) Anal. Biochem. 169(1) 104-8; all references being specifically incorporated herein.

To link an oligonucleotide to a nylon support, as described by Van Ness *et al.* (1991), requires activation of the nylon surface via alkylation and selective activation of the 5'-amine of oligonucleotides with cyanuric chloride.

One particular way to prepare support bound oligonucleotides is to utilize the light-generated synthesis described by Pease *et al.*, (1994) PNAS USA 91(11) 5022-6, incorporated herein by reference). These authors used current photolithographic techniques to generate arrays of immobilized oligonucleotide probes (DNA chips). These methods, in which light is used to direct the synthesis of oligonucleotide probes in high-density, miniaturized arrays, utilize photolabile 5'-protected *N*-acyl-deoxynucleoside phosphoramidites, surface linker chemistry and versatile combinatorial synthesis strategies. A matrix of 256 spatially defined oligonucleotide probes may be generated in this manner.

4.21 PREPARATION OF NUCLEIC ACID FRAGMENTS

The nucleic acids may be obtained from any appropriate source, such as cDNAs, genomic DNA, chromosomal DNA, microdissected chromosome bands, cosmid or YAC inserts, and RNA, including mRNA without any amplification steps. For example, Sambrook *et al.* (1989) describes three protocols for the isolation of high molecular weight DNA from mammalian cells (p. 9.14-9.23).

DNA fragments may be prepared as clones in M13, plasmid or lambda vectors and/or prepared directly from genomic DNA or cDNA by PCR or other amplification methods. Samples may be prepared or dispensed in multiwell plates. About 100-1000 ng of DNA samples may be prepared in 2-500 ml of final volume.

The nucleic acids would then be fragmented by any of the methods known to those of skill in the art including, for example, using restriction enzymes as described at 9.24-9.28 of Sambrook *et al.* (1989), shearing by ultrasound and NaOH treatment.

Low pressure shearing is also appropriate, as described by Schriefer *et al.* (1990) Nucleic Acids Res. 18(24) 7455-6, incorporated herein by reference). In this method, DNA samples are passed through a small French pressure cell at a variety of low to intermediate pressures. A lever device allows controlled application of low to intermediate pressures to the cell. The results of

these studies indicate that low-pressure shearing is a useful alternative to sonic and enzymatic DNA fragmentation methods.

One particularly suitable way for fragmenting DNA is contemplated to be that using the two base recognition endonuclease, *Cvi*JI, described by Fitzgerald *et al.* (1992) Nucleic Acids Res. 20(14) 3753-62. These authors described an approach for the rapid fragmentation and fractionation of DNA into particular sizes that they contemplated to be suitable for shotgun cloning and sequencing.

The restriction endonuclease *Cvi*JI normally cleaves the recognition sequence PuGCPy between the G and C to leave blunt ends. Atypical reaction conditions, which alter the specificity of this enzyme (*Cvi*JI**), yield a quasi-random distribution of DNA fragments form the small molecule pUC19 (2688 base pairs). Fitzgerald *et al.* (1992) quantitatively evaluated the randomness of this fragmentation strategy, using a *Cvi*JI** digest of pUC19 that was size fractionated by a rapid gel filtration method and directly ligated, without end repair, to a lac Z minus M13 cloning vector. Sequence analysis of 76 clones showed that *Cvi*JI** restricts pyGCPy and PuGCPu, in addition to PuGCPy sites, and that new sequence data is accumulated at a rate consistent with random fragmentation.

As reported in the literature, advantages of this approach compared to sonication and agarose gel fractionation include: smaller amounts of DNA are required (0.2-0.5 ug instead of 2-5 ug); and fewer steps are involved (no preligation, end repair, chemical extraction, or agarose gel electrophoresis and elution are needed.

Irrespective of the manner in which the nucleic acid fragments are obtained or prepared, it is important to denature the DNA to give single stranded pieces available for hybridization. This is achieved by incubating the DNA solution for 2-5 minutes at 80-90°C. The solution is then cooled quickly to 2°C to prevent renaturation of the DNA fragments before they are contacted with the chip. Phosphate groups must also be removed from genomic DNA by methods known in the art.

4.22 PREPARATION OF DNA ARRAYS

Arrays may be prepared by spotting DNA samples on a support such as a nylon membrane. Spotting may be performed by using arrays of metal pins (the positions of which correspond to an array of wells in a microtiter plate) to repeated by transfer of about 20 nl of a DNA solution to a nylon membrane. By offset printing, a density of dots higher than the density of the wells is achieved. One to 25 dots may be accommodated in 1 mm^2, depending on the type of label used. By avoiding spotting in some preselected number of rows and columns, separate subsets (subarrays) may be formed. Samples in one subarray may be the same genomic segment of DNA (or the same gene) from different individuals, or may be different, overlapped genomic clones. Each of the

subarrays may represent replica spotting of the same samples. In one example, a selected gene segment may be amplified from 64 patients. For each patient, the amplified gene segment may be in one 96-well plate (all 96 wells containing the same sample). A plate for each of the 64 patients is prepared. By using a 96-pin device, all samples may be spotted on one 8 x 12 cm membrane. Subarrays may contain 64 samples, one from each patient. Where the 96 subarrays are identical, the dot span may be 1 mm^2 and there may be a 1 mm space between subarrays.

Another approach is to use membranes or plates (available from NUNC, Naperville, Illinois) which may be partitioned by physical spacers *e.g.* a plastic grid molded over the membrane, the grid being similar to the sort of membrane applied to the bottom of multiwell plates, or hydrophobic strips. A fixed physical spacer is not preferred for imaging by exposure to flat phosphor-storage screens or x-ray films.

The present invention is illustrated in the following examples. Upon consideration of the present disclosure, one of skill in the art will appreciate that many other embodiments and variations may be made in the scope of the present invention. Accordingly, it is intended that the broader aspects of the present invention not be limited to the disclosure of the following examples. The present invention is not to be limited in scope by the exemplified embodiments which are intended as illustrations of single aspects of the invention, and compositions and methods which are functionally equivalent are within the scope of the invention. Indeed, numerous modifications and variations in the practice of the invention are expected to occur to those skilled in the art upon consideration of the present preferred embodiments. Consequently, the only limitations which should be placed upon the scope of the invention are those which appear in the appended claims.

All references cited within the body of the instant specification are hereby incorporated by reference in their entirety.

5.0 EXAMPLES

5.1 EXAMPLE 1

Novel Nucleic Acid Sequences Obtained From Various Libraries

A plurality of novel nucleic acids were obtained from cDNA libraries prepared from various human tissues and in some cases isolated from a genomic library derived from human chromosome using standard PCR, SBH sequence signature analysis and Sanger sequencing techniques. The inserts of the library were amplified with PCR using primers specific for the vector sequences which flank the inserts. Clones from cDNA libraries were spotted on nylon membrane filters and screened with oligonucleotide probes (*e.g.*, 7-mers) to obtain signature sequences. The clones were clustered into groups of similar or identical sequences. Representative clones were selected for sequencing.

In some cases, the 5' sequence of the amplified inserts was then deduced using a typical Sanger sequencing protocol. PCR products were purified and subjected to fluorescent dye terminator cycle sequencing. Single pass gel sequencing was done using a 377 Applied Biosystems (ABI) sequencer to obtain the novel nucleic acid sequences. In some cases RACE (Rapid Amplification of cDNA Ends) was performed to further extend the sequence in the 5' direction.

5.2 EXAMPLE 2

Novel Contigs

The novel contigs of the invention were assembled from sequences that were obtained from a cDNA library by methods described in Example 1 above, and in some cases sequences obtained from one or more public databases. The sequences for the resulting nucleic acid contigs are designated as SEQ ID NO: 1-8051 and are provided in the attached Sequence Listing. The contigs were assembled using an EST sequence as a seed. Then a recursive algorithm was used to extend the seed EST into an extended assemblage, by pulling additional sequences from different databases (*i.e.*, Hyseq's database containing EST sequences, dbEST version 115, gb pri 115, and UniGene version 103, and exons from public domain genomic sequences predicted by GenScan) that belong to this assemblage. The algorithm terminated when there was no additional sequences from the above databases that would extend the assemblage. Further, the inclusion of component sequences into the assemblage was based on a BLASTN hit to the extending assemblage with BLAST score greater than 300 and percent identity greater than 95%.

The novel predicted polypeptides (including proteins) encoded by the novel polynucleotides (SEQ ID NO: 1-8051) of the present invention are incorporated in the attached Sequence Listing. A subset of the predicted polypeptide sequences contain an unknown amino acid; a stop codon; a possible nucleotide deletion; or a possible nucleotide insertion. These sequences have also been shown in their entirety in Table 2. Table 2 also shows the corresponding start and stop nucleotide locations to each of SEQ ID NO: 1-8051. Table 2 also indicates the method by which the polypeptide was predicted. Method A refers to a polypeptide obtained by using a software program called FASTY (available from http://fasta.bioch.virginia.edu) which selects a polypeptide based on a comparison of the translated novel polynucleotide to known polynucleotides (W.R. Pearson, Methods in Enzymology, 183:63-98 (1990), herein incorporated by reference). Method B refers to a polypeptide obtained by using a software program called GenScan for human/vertebrate sequences (available from Stanford University, Office of Technology Licensing) that predicts the polypeptide based on a probabilistic model of gene structure/compositional properties (C. Burge and S. Karlin, J. Mol. Biol., 268:78-94 (1997), incorporated herein by reference). Method C refers

to a polypeptide obtained by using a Hyseq proprietary software program that translates the novel polynucleotide and its complementary strand into six possible amino acid sequences (forward and reverse frames) and chooses the polypeptide with the longest open reading frame.

The nearest neighbor results for SEQ ID NO: 1-8051 were obtained by a BLASTX version 2.0al 19MP-WashU search against Genpept release 123 and Geneseq release 200110 (Derwent), using BLAST algorithm. The nearest neighbor result showed the closest homologue for SEQ ID NO: 1-8051. The nearest neighbor results for SEQ ID NO: 1-8051, having identifiable function(s) are incorporated in the attached Sequence Listing.

Using eMatrix software package (Stanford University, Stanford, CA) (Wu et al., J. Comp. Biol., Vol. 6 pp. 219-235 (1999) herein incorporated by reference), all the polypeptide sequences were examined to determine whether they had identifiable signature regions. The attached Sequence Listing provides the results obtained by eMatrix analysis for each polypeptide as follows: the signature region found in the indicated polypeptide sequences, the description of the signature, the eMatrix p-value(s) and the position(s) of the signature within the polypeptide sequence.

Using the pFam software program (Sonnhammer et al., Nucleic Acids Res., Vol. 26(1) pp. 320-322 (1998) herein incorporated by reference) all the polypeptide sequences were examined for domains with homology to certain peptide domains. The attached Sequence Listing provides the results obtained by pFam analysis for each polypeptide, namely: the name of the domain found, the description, the p-value and the pFam score for the identified domain within the sequence.

Tables 1 and 2 follow. Table 1 shows the various tissue sources of SEQ ID NO: 1-8051. Table 2 shows the start and stop nucleotides for the translated amino acid sequence for which each assemblage encodes. Table 2 also provides a correlation between the amino acid sequences set forth in the Sequence Listing, the nucleotide sequences set forth in the Sequence Listing and the SEQ ID NO: in USSN 09/577,408.

TABLE 1

Tissue Origin	Tissue/ RNA Source	Library Name	SEQ ID NO:
adult brain	GIBCO	AB3001	53-57 119-121 205-206 229-232 311-314 318-320 328-331 340-341 360-361 382-383 398 400 433 444 448-449 455 461-465 467-468 476-479 488 501-504 506 508-513 522-526 533-535 541-542 559-560 562 637-640 649 654-655 658 679-683 751-752 755 757-764 766 771 780-782 841-849 857 867-869 872-874 879 884-885 890 915-917 945 969 1006-1009 1031-1035 1101-1103 1110 1112 1115 1120-1121 1123 1131 1185-1190 1252 1299-1301 1303-1304 1314-1316 1338 1355-1359 1361-1363 1382-1387 1395-1399 1447 1458-1460 1473-1477 1479-1481 1484-1485 1489-1493 1495-1496 1498 1515 1517 1534-1535 1565-1566 1601 1603 1612 1614-1619 1621-1622 1626 1642-1644 1646 1679 1690-1693 1695-1696 1698-1704 1706-1715 1717-1718 1726 1728-1737 1739-1748 1751-1760 1762-1763 1768-1771 1782 1843 1847 1862-1863 1877-1880 1882-1886 1895-1901 1904-1905 1922 1976-1991 2023 2034 2171-2174 2182-2184 2200-2203 2220-2223 2232-2233 2250 2332-2339 2347-2350 2352-2356 2359-2361 2371-2372 2375 2380 2383-2384 2386-2388 2466-2469 2485-2489 2533 2547-2550 2575 2585-2586 2588-2589 2602 2682-2686 2688 2714-2715 2737 2739-2741 2744-2745 2789-2791 2798-2802 2839-2841 2899 2910-2918 2920-2922 2924 2952-2955 3043-3050 3095-3096 3101-3102 3104-3105 3109-3110 3116-3117 3134-3135 3179-3180 3223-3224 3236-3237 3260-3261 3265 3271-3272 3280-3282 3311 3325 3349-3350 3354 3393-3395 3397-3400 3491-3493 3499-3503 3517-3519 3521-3523 3560 3581-3582 3588-3589 3592-3596 3617-3619 3631 3683 3696 3698-3702 3762-3763 3801 3805 3834-3835 3837-3838 3850-3855 3866 3944 3955 3967 3979-3985 3990 4017-4020 4081 4098 4100-4103 4126-4127 4189-4190 4193 4226 4266-4269 4271-4272 4298-4301 4303 4320-4323 4325 4341 4344-4345 4347-4349 4427-4428 4436 4454 4537-4541 4543 4549-4550 4552-4554 4564-4567 4576 4580-4591 4599 4610 4698 4710 4806-4808 4810 4812 4833 4847-4853 4884-4885 4910 4940-4941 4943-4944 4952 4954-4958 4972 5033-5038 5040-5044 5056-5060 5062 5105 5116 5137 5141 5158-5161 5163 5166-5167 5226-5227 5229-5233 5236-5238 5240-5249 5252-5261 5263-5267 5272 5274 5340-5341 5478-5480 5525 5546-5547 5566-5570 5581 5628-5634 5644 5760 5771 5782 5872 5881-5887 5904 5911 5971-5976 6003 6007 6037-6038 6074 6124-6128 6189 6191-6194 6198 6231-6233 6249-6250 6339-6340 6360 6413-6414 6553-6556 6586-6587 6656 6681 6722-6727 6729-6736 6771 6782 6794 6805 6903 6906 6939-6942 7044-7051 7053 7055-7056 7087-7089 7116 7131 7254-7255 7294 7340 7377-7379 7662 7677 7686 7697 7730 7732-7734 7741 7744-7760 7763 7775 7808-7810 7835-7836 7847 7942 8025
adult brain	GIBCO	ABD003	4-5 28-29 44 47 205-206 211-212 229-232 246-248 250-259 261-266 282-284 318-320 323-328 338-341 349-354 356-359 368-375 382-383 385-386 397-398 400 404-409 426-427 433 444-449 455 476-479 486-489 492-493 495-497 500-504 506 508-515 517 522-526 528-529 555-556 584-592 602-604 606-614 616 622 624 627-633 635-640 649 658 666 668 672-676 679-683 686-688 690-692 704-707 722-723 726 768-769 771 782 841-843 846-849 857 867-869 872-874 876-881 884-885 890 893-895 900 902 911-917 919-921 923-927 929 945 960-962 969 973 979-985 991-993 995-1000 1006-1009 1020 1031-1035 1037-1040 1042-1043 1056-1057 1063 1070-1072 1083 1086-1094 1100-1109 1111 1113 1115 1119-1123 1129 1131 1137-1148 1165 1174-1175 1183 1185-1197 1204 1210-1212 1221-1225 1227-1232 1236-1237 1241-1242 1250 1253 1264-1265 1267-1270 1272 1279-1281 1286 1291-1293 1303-1306 1308-1309 1314-1316 1334-1336 1338-1344 1355-1359 1361-1363 1365-1368 1370 1372-1375 1382-1390 1392-1400 1411-1413 1423 1438-1439 1442-1445 1447-1449 1451-1456 1476-1477 1484-1485 1489-1493 1495-1496 1500 1503-1504 1506-1507 1515 1523-1524 1534-1536 1538 1549 1560 1564-1571 1576-1578 1595-1601 1603 1610 1621-1622 1626 1640-1641 1644 1646 1648-1652 1674 1676-1680 1691-1693 1695-1696 1698-1700 1703-1704 1706 1711-1713 1718 1732-1736 1741-1745 1747-1748 1751-1754 1764 1768-1779 1781-1790 1792-1805 1807-1819 1821-1826 1828-1837 1839-1844 1850

Tissue Origin	Tissue/ RNA Source	Library Name	SEQ ID NO:
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adult brain	Clontech	ABR001	27 39-42 53 136-143 145-154 156-163 282-284 297-298 338-339 374 408-409 411-420 422 436-441 476 478-479 528-529 552-554 666 668 703-706 754 773 784 795 806 840-843 859-862 915-917 919-921 929 999-1000 1037-1040 1042-1043 1104-1109 1131 1165 1198-1201 1291-1293 1303-1306 1308-1309 1334-1336 1339-1340

Tissue Origin	Tissue/ RNA Source	Library Name	SEQ ID NO:
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adult brain	Clontech	ABR006	55 122 126-130 136-154 156-163 168-169 178-180 194-195 340-341 360-361 368-373 431 434-435 457-459 476 478-479 495-497 528-529 584-592 607-612 622 624 649-655 658 674-676 757-764 766 780-781 823-825 867 869 878 880-881 884-885 969 999-1000 1006-1009 1073-1080 1167-1172 1191 1338 1341-1344 1370 1372-1373 1382-1384 1420 1438-1439 1442-1445 1470-1471 1486-1493 1495-1496 1503-1504 1506-1507 1543-1547 1596-1600 1615-1619 1621-1622 1628-1633 1635 1644 1646 1648-1652 1667-1670 1690 1718 1732-1736 1747-1748 1751-1754 1768-1772 1774 1862-1863 1938-1945 1965-1967 2001 2012 2014-2015 2039-2040 2063 2084 2097 2099-2100 2114-2117 2141 2146 2157 2162-2163 2168 2179 2185-2187 2196 2200 2206 2217 2228 2234-2242 2244 2253 2265 2285-2286 2332-2339 2352-2356 2359-2361 2380 2387-2388 2412-2417 2419-2423 2425-2427 2495 2533 2575 2625-2626 2628 2683-2686 2688 2764 2767-2768 2792-2793 2798-2804 2839-2841 2900-2908 2934-2937 2955 3052 3065 3087-3091 3093 3095 3107 3127-3132 3143 3151-3155 3216 3236-3237 3342 3350 3352 3385 3396 3411 3458-3459 3521-3523 3588-3589 3627 3719 3749 3772 3791-3794 3890 3909-3910 3912 3974 3996 4017-4020 4064 4091-4097 4104-4105 4183-4185 4306-4307 4341 4404-4405 4518-4519 4521 4529 4533-4536 4582-4585 4688-4689 4748 4847-4853 4952 4954-4958 5010-5013 5090-5093 5095 5123 5131-5132 5142-5143 5193-5194 5196 5277-5281 5316 5409 5664 5764-5770 5772-5781 5783-5785 5933 6175 6181-6182 6300-6303 6311-6313 6424-6427 6493 6624-6625 6658-6660 6662-6666 6735 6871 6882 6888-6889 6899-6900 6939-6942 7063 7397 7493-7494 7504 7515 7526 7535 7546 7558 7569 7587-7589 7616 7677 7686 7697 7725-7726
adult brain	Clontech	ABR008	2 16-17 19 21 45 47 55 58-59 61-66 77-87 89-98 100-110 112-117 122 126-132 134 136-154 156-165 168-169 192-195 208 211-213 221 237-239 249 260 265-266 269 280 282-284 297-298 321 323-325 328 335-337 340-341 360-361 368-374 382-383 387 389-398 400 404-409 423 428-430 432 436-441 448-449 457-459 476 478-482 495-497 500 527-529 536-540 550 552-554 567-571 573-580 586-592 602 607-614 616 622 624 627-633 635-640 645 649 654-655 663-664 666 668 682-683 685-688 690-691 704-707 710-719 721-725 744-745 751-753 755 757-764 766 773 780-781 784 795 806 816 818 823-827 841-849 856 859-862 864-866 872-874 880-881 883-885 896-900 902 915-917 919-921 929 931 945-948 954 962-965 967-968 979 988 994 999-1000 1006-1009 1015-1017 1031-1035 1037-1040 1042-1043 1054-1055 1073-1080 1101-1110 1112 1119-1121 1123 1152 1155-1160 1163 1167-1172 1174-1175 1177-1179 1181 1192-1193 1195-1196 1198-1201 1210 1221-1227 1231-1232 1236-1237 1241-1249 1251 1266 1273-1275 1279-1281 1283 1287 1289 1299-1301 1305-1309 1328-1331 1334-1338 1341-1344 1381 1388-1390 1392-1400 1416-1418 1420 1423 1428 1430 1432-1440 1442-1445 1447 1450 1461-1465 1472 1486-1493 1495-1496 1499-1500 1510-1513 1520 1543-1549 1559-1561 1596-1601 1603-1606 1611-1612 1614-1619 1628-1633 1635 1640-1643 1648-1654 1657-1663 1671-1672 1686-1693 1695-1696 1698-1699 1703-1704 1706 1710-1713 1718-1725 1730-1736 1738 1747-1760 1762

Tissue Origin	Tissue/ RNA Source	Library Name	SEQ ID NO:
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Tissue Origin	Tissue/ RNA Source	Library Name	SEQ ID NO:
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adult brain	BioChain	ABR012	28-29 432-433 444 455 476 478-479 483 486-487 489 538 618-620 645 753 856 954 979 1299-1301 1654 1703-1704 1706 1732-1736 1749 1849 2016-2022 2347-2349 2425-2427 2898 2909 3212 3222 3233 4952 4954-4958 4978-4980 5645-5648 7771-7772
adult brain	BioChain	ABR013	476 478-482 486-487 489 1133-1135 1305-1306 1308-1309 1701-1702 2024-2026 2347-2349 2425-2427 2621-2624 2682-2686 2688 2898 2909 3056-3063 3134-3135 3743 3772 4952 4954-4958 5272 5274 6545-6546 7771-7772
adult brain	Invitrogen	ABR014	1694 1697 1703-1704 1706 1775-1777 1862-1863 1910 2135-2137 2200-2203 2216 2218 2528 2539 2545 2556 2567 2822 3055 3101-3102 3104-3105 3116-3117 3506 3885-3886 3979-3985 4702 5176 5272 5274 6353 6356-6358 6413-6414 6419 6424-6427 6824-6826 6828-6829 7044 7186 7197
adult brain	Invitrogen	ABR015	202-203 1534-1536 1538 1644 1646 1648-1652 1718 1741-1745 1782 1843 2084 2136 2232-2233 2838 2952-2954 2962-2971 3349 3916-3921 3923-3932 3934-3936 4571-4574 4587 4590-4591 4599 4610 4698 4710 4737-4739 5176 5272 5274 5654-5656 6191 6198 6903 6906 7822-7823
adult brain	Invitrogen	ABR016	28-29 56 1534-1536 1538 1612 1614 1642-1643 1755-1760 1762 1946 1948-1951 2010-2011 2013 2016-2022 2137 2204-2205 2207-2208 2835 2837 2853-2854 2857-2858 2955 3039-3040 3071-3077 3463 3853-3854 3990 4554 4565 4576 4737-4739 5272 5274 5298 6195-6196 6353 6356-6358 6424-6427 6761 6851-6854
adult brain	Invitrogen	ABT004	55 66 77 126-130 144 168-169 201 237-239 265-266 326-327 360-361 368-373 382-383 466 480-482 486-487 489 500 528-529 536-537 540 567-570 593 595-596 607-614 616 654-655 666 668 682-683 744-745 773 782 784 795 806 823-825 846-849 872-874 911-912 919-921 945-948 969 979 999-1000 1073-1080 1119 1152 1163 1177-1179 1198-1201 1221-1225 1227 1299-1301 1326 1338-1340 1346-1348 1350-1359 1361-1363 1369 1374-1375 1381 1388-1390 1438-1439 1442-1445 1462-1465 1484-1493 1495-1496 1529-1535 1572-1575 1587-1588 1601 1603 1615-1619 1628-1633 1635 1640-1641 1686-1689 1691-1693 1695-1696 1700 1703-1704 1706-1709 1718 1747-1748 1751-1760 1762 1790 1792-1795 1806 1823-1824 1862-1865 1887 1895-1901 1904-1905 1914 1925 1930-1935 1974 2002-2008 2087 2097 2099-2100 2114-2117 2185-2186 2250 2276 2289-2294 2328 2330 2332-2339 2347-2350 2374 2383-2386 2396 2407 2418 2425-2427 2429 2437 2448 2459 2466-2470 2482 2500-2502 2528 2539 2545 2556 2567 2572-2574 2590-2594 2679-2681 2706-2707 2718-2721 2723-2725 2750-2753 2764 2766-2768 2777 2784 2803-2804 2849-2850 2853-2855 2857-2858 2900-2908 2919 2936-2937 2955 2962-2971 2989-2990 2992-2993 3003-3008 3070-3072 3101-3102 3104-3105 3107 3112-3113 3115 3118-3119 3121 3151-3158 3195-3196 3209-3211 3213-3215 3223-3224 3260-3261 3278-3279 3310 3322 3356-3357 3389 3436-3437 3449-3450 3452 3511 3581-3582 3584 3620-3622 3732 3741-3742 3745 3772-3773 3775 3782 3791-3794 3806-3807 3809-3810 3813 3839 3856-3859 3861-3865 3867-3871 3881 3888 3958-3964 4009 4024-4025 4087 4089-4090 4114-4120 4128 4183-4185 4193 4218 4220 4227 4233 4309-4311 4373-4374 4377 4415 4433 4443 4486 4491-4493 4531 4537-4539 4542 4551 4622-4624 4671-4672 4753 4755-4756 4765 4774-4776 4787 4798 4809 4821 4832 4838-4841 4843 4845 4847-4854 4861-4869 4872-4880 4884-4885 4905 4917-4918 4921-4926 4940-4941 4943-4944 4952 4954-4958 4964 4969-4971 4975 4995 5010-5013 5056-5060 5062 5082 5125-5126 5128-5130 5168-5169 5216 5218-5221 5272 5274 5307 5333-5335 5400 5537 5539 5579 5599-5603 5678-5680 5747-5748 5928 5979 5981-5982 6022 6025-6032 6043-6045 6047-6048 6104-6106 6112 6143-6145 6148-6152 6178 6197 6249-6250 6333-6335 6450-6451 6453 6455-6456 6604 6627 6629 6639 6650 6656 6687-6688 6693 6709 6711-6712 6733-

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cultured preadipocytes	Stratagene	ADP001	25 28-29 36 40-42 123-124 168-169 178-179 229-233 237-239 265-266 315-320 323-325 352-354 356-359 382-383 423 432-433 444 448-449 455 476 478-479 483 500 518-521 525-526 538 552-554 603-604 606-612 637-640 645 649 654-655 658 666 668 708 730 744-745 753 780-781 833-835 841-845 856 884-885 923-927 949-950 954 969 987 1015-1017 1019 1024-1028 1156-1160 1165 1181 1192-1193 1195-1196 1236-1237 1264-1265 1273-1275 1299-1301 1305-1306 1308-1309 1322 1355-1359 1361-1363 1374-1375 1424-1426 1534-1535 1552-1558 1572-1575 1621-1622 1628-1633 1635 1654 1657-1663 1686-1689 1701-1704 1706 1749 1775-1777 1782 1790 1792-1794 1796-1797 1832-1834 1836-1837 1839-1843 1845 1849 1867 1874-1876 1922 1935 2081-2083 2085-2086 2088-2091 2105-2108 2124-2127 2171-2174 2181 2204-2205 2207-2208 2216 2218 2220-2223 2234-2238 2240-2242 2284 2328 2330 2345-2346 2352-2356 2359-2361 2381-2382 2401-2406 2408-2410 2425-2427 2498-2499 2503 2505-2506 2533 2544 2546 2576-2577 2584-2586 2588-2589 2602 2632-2634 2682 2699-2704 2706-2708 2750-2753 2764 2767-2770 2787 2792 2798-2802 2830-2833 2849-2850 2898 2909 3039-3040 3043-3050 3081 3092 3101-3105 3111 3114 3133 3209-3211 3213-3215 3223-3224 3249-3250 3289-3295 3297 3356-3357 3499-3501 3506 3560 3575-3576 3579-3580 3697 3708 3713-3714 3717-3718 3720-3722 3732 3749 3782 3788-3790 3796 3802 3916-3921 3923-3932 3934-3936 4002 4083-4085 4087 4089-4097 4138-4142 4144-4146 4172-4173 4176 4256-4258 4320-4323 4325 4357 4368 4373-4374 4379 4537-4539 4571-4574 4582-4585 4633-4642 4644-4649 4671-4672 4705 4728-4729 4753 4755-4756 4837 4842 4844 4884-4886 4888 4910 5087 5137 5141 5182-5183 5185-5187 5265-5266 5277-5281 5319-5322 5468-5469 5566-5569 5591-5593 5595-5596 5638 5644-5648 5654-5656 5694 5705 5747-5748 5910 5918-5919 5934-5935 5937-5938 5961 6022 6025-6029 6055-6056 6058-6060 6069 6088 6183 6201 6209-6211 6242-6243 6283 6339-6340 6361-6362 6440 6442 6517-6518 6521-6529 6553-6554 6627 6629 6658-6660 6662-6666 6747-6749 7162 7185 7187 7238 7291-7293 7321-7322 7362-7363 7365 7377-7379 7393-7395 7427 7551-7553 7613-7614 7644 7655 7808-7810 7984-7986 7988-7990
adrenal gland	Clontech	ADR002	9-11 15 53 55 66 77 123-124 205-206 229-233 265-266 282-284 318-320 323-325 368-373 432-433 444 455 476 478-479 483 495-497 501-504 506 508-513 518-521 533-535 538 547-549 551-554 574-582 597-600 602-604 606-614 616 645 658-662 666 668 672-673 684-688 690-691 704-706 726-728 746 753 780-783 816-818 823-825 833-835 856 872-874 876-877 900 902 911-913 923-927 954 959 970 973-976 978 991-993 995-997 1006-1009 1015-1017 1031-1035 1037-1040 1042-1043 1056-1057 1063 1072 1083 1089 1100-1103 1111 1115-1118 1120-1123 1129-1130 1140 1146-1148 1165 1173 1176-1179 1185-1190 1197 1202-1203 1205-1207 1210 1213-1214 1216-1218 1231-1232 1258 1261 1264-1265 1287 1289 1299-1301 1305-1306 1308-1313 1323-1325 1328-1331 1339-1340 1355-1359 1361-1363 1385-1387 1400 1408 1420 1448-1449 1451-1456 1476-1481 1498 1521-1522 1534-1535 1543-1547 1559 1561-1562 1565-1566 1604-1606 1611 1626 1640-1641 1654-1655 1674 1676-1678 1681-1684 1701-1706 1716 1727 1730-1731 1737 1739-1740 1749 1807 1825-1826 1828-1831 1836-1837 1839-1843 1845 1849-1850 1852-1855 1858-1865 1870 1877-1880 1882-1886 1895-1901 1904-1905 1975 2002-2008 2010-2011 2013 2024-2033 2035-2036 2038-2040 2063 2081-2083 2105 2118-2123 2128-2129 2131-2134 2144 2147-2152 2162-2163 2204-2205 2207-2208 2216 2218 2284 2289-2294 2319 2332-2339 2341-2344 2347-2350 2359-2361 2387-2388 2391-2394 2425-2428 2430-2434 2450-2451 2464-2465 2494-2495 2549-2552 2585-2586 2588-2589 2629-2631 2646-2654 2656-2663 2674-2676 2679-2681 2695-2697 2699-2704 2708 2714-2715 2730-2733 2750-2753 2764 2767-2768 2774-2776 2787 2798-2804 2835 2837 2842-2843 2898 2900-2909 2936-2937 2978-2979

Origin	RNA Source		
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adult heart	GIBCO	AHR001	7 9-11 28-29 39 47 55 60-68 77-87 89-98 100-109 112-117 123-124 164-165 178-179 205-206 210 215-217 223-232 237-239 246-248 250-259 261-268 270-273 282-284 311-320 328-332 334-341 344 349-359 366 368-375 377 385-400 404-409 426-430 432 436-443 448-454 456 461-465 467-468 476-479 483 486-489 495-497 500-504 506 508-515 517-521 525-526 528-529 538 545-546 552-556 567-571 573-580 586-593 595-596 602-604 606-612 618-620 627-633 635-640 645 649 658 663-664 666 668-669 682-684 686-691 700 704-706 709 720 722-723 731-745 753 768 771 773 780-782 784 795 806 816 818 837 840-845 851 856-857 859-869 878-900 902-909 911-912 914 919-921 923-927 929 937 954 959 962-965 967-969 973 979 987 999-1000 1005-1009 1015-1021 1030-1035 1041 1044-1046 1052-1061 1063 1068-1072 1083 1087-1094 1100-1103 1110-1112 1115 1119-1125 1127-1129 1131 1137-1148 1161-1162 1164-1165 1174-1175 1177-1179 1185-1193 1195-1196 1202-1203 1205-1212 1228-1232 1236-1239 1246 1262-1269 1273-1275 1279-1281 1283-1285 1291-1293 1299-1301 1303-1306 1308-1309 1314-1317 1319 1334-1336 1341-1344 1346-1348 1350-1359 1361-1363 1369 1371 1376 1380 1382-1384 1388-1391 1395-1400 1402 1410-1413 1416-1418 1438-1439 1442-1445 1447-1449 1451-1456 1462-1465 1470-1471 1476-1477 1486-1488 1498 1503-1504 1506-1507 1510-1515 1517 1523-1524 1529-1533 1536 1538 1541-1542 1559 1561 1567-1569 1571 1576-1578 1595-1601 1603-1606 1611-1612 1614-1619 1623 1627-1633 1635 1638-1643 1647-1652 1655 1671-1672 1686-1693 1695-1696 1698-1699 1703-1704 1706 1711-1713 1719-1725 1730-1731 1737 1739-1740 1755-1760 1762 1765-1771 1773 1775-1777 1782-1789 1796-1797 1807 1823-1824 1843 1845 1862-1863 1866-1867 1874-1876 1887-1890 1895-1901 1903-1905 1907-1909 1915-1918 1921-1922 1936 1938-1945 1947 1976 2010-2011 2013-2022 2024-2033 2035-2036 2039-2041 2052 2081-2083 2105-2108 2113-2117 2124-2127 2136-2137 2143 2153-2156 2158-2159 2161 2164-2166 2169-2174 2177-2178 2180 2188-2195 2197-2200 2204-2205 2207-2208 2216 2218 2220-2223 2225-2227 2229-2238 2240-2242 2246 2284 2287 2289-2294 2328 2330-2339 2345-2350 2352-2356 2359-2361 2369-2372 2374-2375 2380-2382 2385 2389-2390 2395-2410 2412-2423 2425-2434 2436-2438 2448 2450-2459 2464-2475 2480 2482-2484 2492 2495-2503 2505-2506 2508-2509 2511-2516 2518-2527 2529-2531 2533 2544 2546 2549-2550 2558-2562 2564-2565 2569-2575 2584-2586 2588-2589 2602 2612 2629-2634 2639-2640 2664-2665 2667 2674-2676 2678 2682-

Tissue Origin	Tissue/ RNA Source	Library Name	SEQ ID NO:
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adult kidney	GIBCO	AKD001	9-11 13 15-17 25 27-29 36 40-42 47 55 60 66 69-73 77 80-109 111-117 122-124 126-130 133 178-179 184-187 189-190 205-206 223-232 237-239 246-248 250-259 261-267 282-284 297-298 318-320 323-331 335-337 340-341 344 352-361 365-367 374-375 377 382-

Tissue Origin	Tissue/ RNA Source	Library Name	SEQ ID NO:
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adult kidney	Invitrogen	AKT002	18 44 69-72 80-87 89-98 100-109 112-117 123-124 133 168-169 265-266 268 270-273 318-320 323-325 328 335-337 340-341 385-387 389-397 426-427 431 434-435 450-454 456 486-487 489 501-504 506 514-515 517 584-593 595-596 602 607-614 616-620 627-633 635-640 654-655 663-664 670-671 679-681 722-723 747 780-781 823-825 844-845 876-877 883-885 900 902 915-917 949-950 959 963-965 967-970 979 1006-1009 1019 1024-1028 1056-1057 1087-1088 1090-1094 1101-1103 1115-1121 1123 1127-1128 1165 1192-1193 1195-1196 1202-1203 1205-1207 1211-1214 1216-1218 1228-1230 1241-1242 1257 1269 1294-1295 1297-1301 1303-1304 1314-1316 1323-1325 1341-1344 1355-1359 1361-1363 1388-1390 1405-1406 1424-1426 1438-1439 1442-1445 1447 1450 1461 1472 1498 1503-1504 1506-1507 1521-1522 1529-1533 1536 1538 1543-1547 1562 1565-1566 1576-1579 1581-1582 1625 1648-1652 1657-1663 1690-1693 1695-1696 1703-1704 1706 1711-1713 1746 1765-1767 1773 1775-1777 1783-1790 1792-1794 1806 1825-1826 1828-1831 1843 1845 1866-1869 1895-1901 1904-1905 1915-1918 1922 1938-1945 1952-1957 1960-1961 1963 1976-1978 1980-1989 1991 2010-2011 2013 2016-2023 2027-2036 2039-2041 2052 2106-2108

Tissue Origin	Tissue/ RNA Source	Library Name	SEQ ID NO:
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adult lung	GIBCO	ALG001	19 28-29 44 74-76 78-79 123-124 178-179 205-206 229-232 246-248 250-259 261-264 282-284 318-320 344 355 366 368-374 377 385-386 388 397-400 404-407 426-427 433 444 448-456 466 476-479 484-485 488 492-493 500 508-515 517-526 541-542 545-546 552-554 593 595-596 602-604 606 658 704-707 744-745 769 782 836 844-845 851 859-862 876-877 880-881 892 900 902 911-912 914 923-927 930 935-936 938 969-970 973 999-1000 1006-1009 1024-1028 1058-1061 1063 1068-1069 1072 1083 1089 1096-1103 1111 1113 1115-1118 1122 1124-1126 1129 1140 1146-1148 1156-1160 1165 1174-1175 1185-1190 1221-1225 1227 1267-1268 1282 1299-1301 1303-1304 1317 1319 1323-1325 1341-1348 1350-1354 1371 1380 1391 1402 1410-1413 1424-1426 1438-1439 1442-1446 1489-1493 1495-1496 1503-1504 1506-1507 1541-1542 1612 1614-1619 1644 1646 1648-1652 1681-1684 1690 1698-1699 1703-1704 1706 1711-1713 1730-1731 1747-1748 1751-1754 1775-1777 1782-1789 1799-1804 1836-1837 1839-1842 1858-1860 1871-1876 1887 1904-1905 1911-1913 1922 1946 1948-1951 1977-1978 1980-1989 1991 1996-2000 2010-2011 2013 2016-2022 2039-2040 2081-2083 2102 2105 2124-2127 2136 2143 2181 2185-2186 2188-2195 2197-2199 2204-2205 2207-2208 2216 2218 2225-2227 2229 2332-2339 2345-2350 2359-2361 2387-2388 2425-2428 2430-2432 2439-2444 2455-2458 2496-2502 2510 2517 2528 2533 2539 2545 2556 2563 2567 2575 2579-2583 2595-2597 2599-2601 2629-2631 2679-2682 2690-2693 2699-2704 2714-2715 2744-2745 2763 2766 2787 2789-2791 2803-2804 2806-2807 2813-2820 2838 2915-2917 2922 2924 2943-2944 3011-3012 3014 3018-3019 3043-3050 3078-3080 3082-3091 3093 3095 3127-3132 3183 3192 3212 3218 3222-3224 3226 3233-3235 3355 3436-3438 3463 3499-3501 3506 3521-3523 3560 3563-3564 3581-3582 3592-3596 3610-3612 3615-3616 3626 3631 3679 3691 3696 3698-3702 3713-3714 3732 3745 3762 3764-3765 3788-3790 3805 3832-3833 3855 3892 3903 3911 3922 3937-3940

Tissue Origin	Tissue/ RNA Source	Library Name	SEQ ID NO:
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lymph node	Clontech	ALN001	20-21 28-29 34-35 37 40-42 80-87 89-98 100-109 112-117 282-284 335-337 349-351 365 367 387 389-396 432 448-454 456 476-479 488 500-504 506 518-524 536-538 540 552-554 603-604 606 618-620 645 649 747 753 769 846-849 856 923-927 939-943 954 973 979 999-1000 1019 1021 1029-1030 1041 1052 1056-1057 1063 1070-1072 1083 1089 1100 1111 1115-1118 1122 1124-1125 1129 1131 1133-1135 1140 1167-1172 1310-1313 1427 1447 1473-1475 1498 1576-1578 1595 1604-1606 1648-1652 1680 1768-1771 1775-1777 1782 1843 1845 1850 1861 1870 1887 1935 2137 2143 2162-2163 2200 2216 2218 2232-2233 2289-2294 2319 2322-2327 2345-2346 2350 2352-2356 2359-2361 2363-2365 2387-2388 2425-2427 2449 2466-2469 2490-2491 2563 2575 2590-2594 2607-2611 2632-2634 2682 2694 2744-2745 2750-2753 2763 2787 2795 2803-2804 2856 2865 2876 2910-2914 2955 2977 2982-2987 3010 3020-3022 3039-3040 3043-3050 3095 3116-3117 3127-3132 3218-3219 3260-3264 3311 3412-3415 3417 3419 3439 3499-3501 3521-3523 3575-3576 3579-3580 3592-3596 3600 3677 3679 3713-3714 3717-3718 3720-3722 3760 3769 3774 3776 3786 3797 3799 3913-3915 3937-3940 3944 3955 3967 4102-4103 4106-4108 4114-4120 4250-4258 4316 4357 4368 4379 4411 4436 4478 4575 4577-4579 4587 4599 4610 4616-4617 4633-4642 4644-4649 4677-4679 4688-4689 4745 4870-4871 4904 4978-4980 5020 5075-5076 5078-5081 5105 5107-5120 5224 5265-5266 5292-5294 5312-5313 5356 5486-5489 5531-5533 5563 5573 5594 5605 5616 5627 5645-5648 5653-5656 5667-5671 5841-5845 5875-5878 5962-5963 5987-5988 6005-6007 6022 6025-6029 6073 6104-6106 6148-6152 6179 6260-6265 6267-6274 6283-6285 6399 6410 6508 6553-6554 6615 6619-6621 6679 6778 6780-6781 6803 6920-6921 6984-6987 6998 7069-7070 7098-7107 7109 7231 7241 7252 7257-7258 7270 7314-7316 7356 7377-7379 7453-7460 7508 7587-7589 7688 7708 7719 7801-7803 7820 7839 7895-7897 7969-7973 8044-8046
young liver	GIBCO	ALV001	16-17 28-29 118-121 192-193 223-232 268 270-273 282-284 295-301 318-320 326-328 335-337 352-354 356-359 368-374 376 378-381 387 389-397 431 433-435 444 455 477 488 492-493 501-504 506 508-515 517 536-537 540 547-549 551-554 557-558 574-580 586-593 595-596 602 613-614 616 627-629 637-644 650-655 666 668 689 700 708-709 720 722-723 731 742 782 844-845 851 863 872-874 884-885 893-895 900 902 923-927 945 969 973 1006-1009 1037-1040 1042-1043 1101-1103 1110 1112 1115 1124-1125 1136 1165 1177-1179 1191 1213-1214 1216-1218 1226 1228-1230 1236-1237 1246 1264-1265 1267-1268 1279-1281 1294-1295 1297-1301 1339-1340 1346-1348 1350-1359 1361-1363 1365-1369 1374-1375 1416-1418 1424-1426 1447 1450 1458-1461 1472 1476-1477 1486-1493 1495-1496 1498 1514 1523-1524 1570 1589-1590 1592-1594 1601 1603 1612 1614-1619 1640-1643 1690 1698-1699 1703-1704 1706 1715 1717-1718 1782-1789 1798 1809 1823-1824 1845-1846 1862-1863 1867 1874-1876 1881 1891-1901 1907-1909 1935 1938-1940 1992-1995 2039-2040 2105 2114-2118 2120-2127 2143 2177-

Tissue Origin	Tissue/ RNA Source	Library Name	SEQ ID NO:
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adult liver	Invitrogen	ALV002	68 73 192-193 198 200 211-212 234 265-266 268 270-273 282-284 295-301 326-327 335-337 376 378-381 423 477 480-482 486-489 495-497 536-537 540 557-558 586-592 613-614 616 627-633 635-636 641-644 650-655 674-676 679-681 707-708 724-725 729 757-764 766 771 782 823-825 840 844-845 872-874 913 915-917 951-953 956 969 991-993 995-997 1019 1054-1055 1087-1088 1090-1094 1116-1119 1124-1125 1146-1148 1165 1177-1179 1191 1202-1203 1205-1207 1213-1214 1216-1218 1243-1245 1250 1253 1257 1270 1272 1279-1281 1287 1289 1299-1301 1314-1316 1339-1340 1355-1359 1361-1363 1376-1379 1409 1423 1458-1460 1479-1481 1499 1514 1529-1533 1549 1560 1563 1589-1590 1592-1594 1601 1603 1625 1628-1633 1635 1638-1639 1642-1643 1648-1652 1657-1663 1681-1684 1690-1693 1695-1696 1698-1699 1703-1704 1706 1730-1731 1737 1739-1740 1747-1748 1751-1754 1790 1792-1794 1825-1826 1828-1831 1845 1858-1860 1867 1874-1876 1941-1946 1948-1951 2098 2110-2112 2137 2139-2140 2142 2147-2152 2171-2174 2177-2178 2180 2188-2195 2197-2199 2220-2224 2234-2238 2240-2242 2284-2286 2319 2345-2346 2380 2466-2469 2515-2516 2518-2527 2533 2564-2565 2629-2631 2638 2682 2690-2693 2710 2712 2716-2721 2723-2725 2730-2733 2750-2753 2769-2770 2777 2784 2795 2814-2820 2849-2850 2856 2859-2860 2865 2876 2921 3016-3017 3073-3077 3081 3092 3096 3103 3114 3151-3155 3244 3256 3267 3274 3285 3296 3331 3358-3361 3364-3373 3375-3384 3386-3388 3433-3434 3499-3501 3560 3562 3584 3587 3590-3591 3620-3622 3624 3635 3646 3676 3760 3769 3776 3786 3797 3825-3827 3829 3956 3996 4024-4025 4075-4076 4078-4080 4082 4091-4097 4104-4105 4150-4153 4244-4245 4264 4290 4292-4294 4311 4326-4328 4336-4340 4357 4368 4379 4436 4486 4494-4497 4499-4500 4537-4539 4560-4561 4618-4619 4671-4672 4707 4737-4739 4753 4755-4756 4777 4817 4827-4831 4842 4844 4847-4853 4872-4873 4905 4917-4918 4921-4926 4952 4954-4958 4990-4994 5105 5116 5125-5126 5128-5130 5144-5146 5173 5184 5189-5190 5195 5206 5209 5212-5215 5270-5271 5308-5311 5423 5476-5477 5486-5489 5523 5525 5540-5541 5581 5591-5593 5595-5596 5654-5659 5661-5663 5760 5771 5782 5818-5820 5833-5834 5908-5909 5913 5934-5935 5937-5938 6030-6032 6088 6131-6132 6143-6144 6148-

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adult liver	Clontech	ALV003	55 299-301 641-644 649-653 872-874 1941-1945 2136 2285-2286 2641-2642 3171-3172 3468-3469 4063 4067-4068 4104-4105 5233 7186 7197 7808-7810 7849
adult ovary	Invitrogen	AOV001	2 4-6 9-11 22-23 27-29 39-42 44 47 55 61-66 68 77 80-87 89-98 100-110 112-118 123-132 134-135 144 168-169 178-179 181-183 196-197 202-203 207-208 215-217 221 229-232 237-239 246-248 250-259 261-268 270-273 282-284 311-314 318-321 323-331 335-337 340-341 349-354 356-361 368-375 382-383 387 389-398 400 404-409 411-423 426-430 433 436-456 461-468 477 484-489 492-493 500-504 506 508-515 517-526 533-537 540-542 545-546 552-554 567-571 573-580 584-593 595-600 602-604 606-614 616 618-620 622 624 627-633 635-640 646-649 658-664 666,668 670-676 679-683 685-692 700 704-720 722-726 729 731-745 748-749 751-752 755 757-764 766 768-769 771-772 774-775 780-782 816 818 820-821 823-827 829-832 836-838 840-849 851-855 857-858 864-869 872-874 876-877 879-881 883-885 890 900 902 905-909 911-917 923-927 929-930 938 945-948 951-953 956 963-965 967-970 973 979-985 987-988 990-997 1001 1005-1009 1015-1017 1019 1024-1028 1031-1035 1037-1040 1042-1046 1051 1054-1061 1063 1068-1072 1083 1086-1094 1096-1109 1111 1115-1132 1137-1151 1153-1154 1156-1162 1164-1165 1167-1172 1174-1179 1182-1197 1202-1207 1210-1214 1216-1218 1221-1225 1227-1230 1236-1238 1241-1245 1247-1250 1252-1256 1258 1261 1264-1265 1267-1269 1279-1281 1284-1285 1287-1289 1291-1293 1303-1306 1308-1317 1319 1322 1328-1331 1338 1346-1348 1350-1359 1361-1363 1365-1368 1374-1379 1381-1390 1395-1399 1405-1406 1409 1411-1413 1415-1419 1424-1426 1446-1449 1451-1460 1462-1465 1470-1471 1473-1477 1479-1481 1486-1493 1495-1496 1498 1500-1501 1503-1504 1506-1507 1510-1513 1515 1521-1522 1525 1529-1536 1538 1541-1542 1549-1551 1559-1561 1563 1565-1569 1571-1582 1591 1595 1602 1604-1606 1611 1613 1615-1619 1621-1622 1624 1628-1635 1640-1641 1644-1646 1648-1653 1657-1663 1665-1666 1671-1672 1674 1676-1680 1686-1693 1695-1696 1701-1706 1711-1713 1716 1718-1725 1727 1730-1731 1737-1745 1750 1755-1764 1768-1771 1773 1775-1777 1780 1782-1794 1796-1798 1807 1809 1820 1825-1831 1843 1845 1847-1848 1850-1855 1857-1861 1864-1865 1867-1870 1874-1880 1882-1887 1891 1893-1902 1904-1913 1915-1924 1926-1937 1941-1957 1960-1963 1975-1978 1980-1989 1991-2000 2002-2008 2010-2011 2013 2016-2022 2024-2026 2037-2041 2052 2076 2081-2083 2085-2086 2088-2096 2103-2109 2118-2129 2131-2134 2136-2137 2139-2143 2146-2154 2157 2162-2163 2168 2171-2174 2177-2181 2185-2208 2216-2218 2220-2223 2225-2226 2228 2230-2231 2234-2242 2244 2253 2265 2284 2288 2295 2297-2306 2308-2316 2319-2327 2331-2339 2341-2346 2350 2352-2356 2359-2365 2369-2372 2374-2375 2381-2410 2418 2425-2435 2437 2439-2444 2446-2454 2459 2466-2470 2480 2482-2484 2490-2491 2494-2503 2505-2506 2509 2511 2515-2516 2518-2528 2533-2534 2539 2544-2554 2556 2558-2565 2567 2569-2577 2584-2586 2588-2597 2599-2601 2603-2605 2625-2626 2628-2642 2645 2655 2664-2667 2672-2676 2678-2688 2690-2712 2714-2715 2718-2725 2729-2733 2737-2741 2744-2748 2750-2753 2757 2762-2764 2766-2772 2774-2776 2781-2783 2785-2795 2798-2804 2806-2812 2814-2821 2827 2829-2835 2837 2842-2843 2846 2853-2855 2857-2858 2898 2900-2914 2918 2920-2922 2924-2931 2936-2939 2941-2942 2945-2948 2951-2960 2962-2971 2973-2974 2978-2979 2981-2990 2992-3001 3009-3012 3014-3025 3035 3039-3040 3053-3054 3064 3066-3067 3073-3077 3087-3091 3093 3095-3096 3098-3100 3106 3109-3113 3115-3119 3123-3125 3127-3140 3147 3151-3158 3179-3180 3183 3188-3189 3194 3206 3212 3217-3219 3221-3222 3227-3228

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placenta	Invitrogen	APL002	40-42 45 136-143 145-154 156-163 223-228 265-266 382-383 423 426-427 436-443 518-521 541-542 617 627-629 649 658 757-764 766 872-874 887-889 891 905-909 969 973 999-1000 1024-1028 1054-1055 1116-1118 1146-1148 1174-1175 1213-1214 1216-1218 1257 1305-1306 1308-1309 1374-1375 1405-1406 1423 1428 1430 1473-1477 1500 1510-1513 1528-1533 1640-1641 1665-1666 1680 1686-1689 1718 1782 1790 1792-1794 1938-1940 1962-1969 1971-1974 1992-1995 2002-2008 2027-2033 2035-2036 2063 2098 2136-2137 2147-2152 2162-2163 2181 2188-2195 2197-2199 2347-2349 2389-2390 2425-2427 2435 2500-2502 2572-2574 2674-2676 2682 2699-2704 2766 2772 2956-2960 3026-3034 3036-3038 3052 3101-3102 3104-3105 3151-3155 3195-3196 3278-3279 3433-3434 3448-3450 3452 3615-3616 3796 3937-3940 3944 3955 3967 3972-3973 4016 4024-4025 4064 4150-4153 4181 4287-4288 4326-4328 4415 4459 4490 4537-4539 4571-4574 4723-4729 4734-4735 4765 4776 4787 4798 4809 4821 4832 4843 4847-4854 4865 4874-4880 4884-4885 4940-4941 4943-4944 5020 5045-5049 5073-5074 5125-5126 5128-5130 5197-5202 5204-5205 5207-5208 5212-5215 5314-5315 5340-5341 5401-5404 5406-5407 5675-5677 5928 6137-6142 6148-6152 6333-6340 6399 6410 6545-6546 6819-6826 6828-6829 6903 6906 7054 7065 7081-7082 7348 7677 7686 7697 7730 7741 7752 7795-7796 7816-7817 7819 8030 8032
adult spleen	GIBCO	ASP001	7 9-11 13 28-29 49-51 55 118 123-124 164-165 167 178-179 213 237-239 246-248 250-259 261-266 268 270-273 282-284 318-320 323-328 338-339 344 355 365-367 374 377 385-386 388 397-400 411-420 422 431 433-441 444-447 455 460 476-479 484-485 488 492-493 495-497 500-504 506 508-515 517 522-529 533-535 541-542 545-546 552-556 567-571 573 586-593 595-596 602 607-614 616 618-620 622 624 627-633 635-636 649 654-655 658 666 668 722-725 747 751-752 755 757-764 766 771 780-781 816 818 841-849 863 872-874 880-881 883-885 893-895 900 902 928 969-970 973 979 1006-1009 1024-1028 1036 1056-1057 1070-1071 1082 1087-1088 1090-1094 1096-1099 1101-1103 1113 1115-1118 1120-1121 1123-1125 1131 1133-1135 1137-1139 1141-1145 1156-1160 1165 1174-1175 1185-1190 1192-1193 1195-1196 1208-1209 1221-1225 1227 1231-1232 1250 1252-1253 1258 1261 1264-1265 1279-

Tissue Origin	Tissue/ RNA Source	Library Name	SEQ ID NO:
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adult testis	GIBCO	ATS001	55 68 78-79 123-124 168-175 178-179 229-232 237-239 246-248 250-259 261-264 311-314 318-320 335-337 340-341 368-374 376 378-381 397 404-407 428-435 444 448-456 476-479 488 492-493 495-497 501-504 506 514-515 517 528-529 538 567-570 593 595-596 602 613-614 616 637-640 645 649 666 668 686-688 690-691 704-706 708 722-723 727-728 732-741 743 753 829-832 841-849 851 856 867 869 872-874 880-881 884-885 887-889 891 900 902-909 913 923-927 946-948 954 959 963-965 967-968 970 973 979 999-1000 1024-1028 1031-1035 1056-1057 1070-1071 1104-1110 1112 1115 1120-1121 1123 1131 1146-1148 1156-1160 1165 1167-1173 1210 1231-1232 1247-1249 1264-1265 1284-1285 1299-1301 1303-1304 1307 1323-1325 1341-1344 1355-1359 1361-1363 1365-1368 1370 1372-1373 1395-1399 1409 1411-1413 1424-1427 1458-1460 1462-1465 1470-1471 1478-1481 1498 1503-1504 1506-1507 1529-1533 1536 1538-1539 1559 1561 1565-1566 1576-1578 1595 1604-1606 1612 1614 1628-1633 1635 1648-1652 1655 1664 1679 1686-1689 1698-1699 1703-1706 1711-1713 1716 1727 1730-1731 1772-1773 1782-1789 1843 1862-1865 1887-1890 1907-1910 1915-1918 1923-1924 1926-1929 1974 2009-2011 2013-2015 2065 2114-

Tissue Origin	Tissue/ RNA Source	Library Name	SEQ ID NO:
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Genomic DNA from BAC 63118	Research Genetics (CITB BAC Library)	BAC001	2251-2252 2254-2263 2266-2275 2277-2281 2994-2997 3533-3536 3538-3547 3549-3558 3916-3921 3923-3932 3934-3936 4765 4776 4787 4798 4809 4821 4832 4843 4854 4865 4876 7944-7947
Genomic DNA from BAC 39316	Research Genetics (CITB BAC Library)	BAC002	2251-2252 2254-2263 2266-2275 2277-2281 2994-2997 3533-3536 3538-3547 3549-3558 3916-3921 3923-3932 3934-3936 5056-5060 5062
Genomic DNA from BAC 39316	Research Genetics (CITB BAC Library)	BAC003	2251-2252 2254-2263 2266-2275 2277-2281 2994-2997 3533-3536 3538-3547 3549-3558 3916-3921 3923-3932 3934-3936 4765 4776 4787 4798 4809 4821 4832 4843 4854 4865 4876 7944-7947
adult bladder	Invitrogen	BLD001	40-42 123-124 329-331 476 478-479 552-554 571 573 682-683 708 710-719 782 816 818 935-936 963-965 967-968 973 1070-1071 1113 1115-1118 1120-1121 1123 1156-1160 1165 1198-1201 1264-1265 1341-1344 1355-1359 1361-1363 1395-1399 1470-1471 1478 1640-1641 1686-1689 1779 1781 1795 1895-1901 1915-1918 1965-1967 1977-1978 1980-1989 1991 2002-2008 2039-2040 2114-2117 2188-2195 2197-2199 2220-2223 2234-2238 2240-2242 2276 2345-2349 2464-2469 2690-2694 2764 2767-2768 2787 2789-2791 2835 2837 2842-2843 2849-2850 2853-2854 2857-2858 2910-2914 2975-2976 3073-3077 3141-3142 3217 3385 3396 3669 3678 3688 3766 3937-3940 3996 4035-4039 4044 4172-4173 4176 4218 4220 4295 4377 4380-4382 4488 4806-4808 4810 4827-4831 4837 4847-4853 5138 5270-5271 5376-5380 5470 5654-5656 5873-5874 5918-5919 6201 6245 6560-6561 6836 6851-6854 6919 6978-6979 7054 7300-7301 7393-7395 7462-7465 7491 7760
bone	Clontech	BMD001	1 22-23 28-29 39-42 44 52 55-56 61-65 67 71-72 74-76 80-98 100-

Tissue Origin	Tissue/ RNA Source	Library Name	SEQ ID NO:
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Tissue Origin	Tissue/ RNA Source	Library Name	SEQ ID NO:
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bone marrow	Clontech	BMD002	28-29 123-124 191 223-232 237-239 246-248 250-259 261-264 318-320 326-327 340-341 344 355 366 368-374 377 385-386 388 398-400 404-407 432 450-454 456 477 484-485 488 500 514-515 517 538 545-546 586-592 602-604 606-612 618-620 645 649 654-655 667 678 722-723 747 753 757-764 766-767 773 784 795 806 841-843 856 887-889 891 900 902 939-943 946-950 954 959 963-965 967-968 973 979 999-1000 1036-1040 1042-1043 1056-1057 1095 1115 1156-1160 1181 1191 1264-1265 1279-1281 1299-1301 1334-1336 1341-1344 1355-1359 1361-1363 1371 1377-1380 1391-1394 1402 1410 1424-1426 1432-1437 1447 1473-1475 1541-1542 1552-1558 1604-1606 1611 1628-1633 1635 1642-1643 1648-1652 1664 1690 1701-1704 1706 1718 1782-1789 1798 1809 1867 1881 1887 1892 1907-1909 1911-1913 1915-1918 1922 1938-1940 1992-1995 2016-2022 2037 2081-2083 2106-2108 2135-2137 2143 2155-2156 2158-2159 2185-2186 2188-2195 2197-2199 2201-2205 2207-2208 2232-2238 2240-2242 2246 2285-2286 2289-2294 2322-2327 2345-2346 2352-2356 2363-2365 2381-2382 2391-2394 2412-2417 2419-2423 2425-2427 2449 2454-2458 2460 2466-2469 2494 2496-2497 2503 2505-2506 2553-2554 2558-2562 2595-2597 2599 2617-2620 2625-2626 2628 2682 2699-2704 2744-2745 2764 2767-2768 2771 2803-2804 2822 2828 2836 2853-2854 2857-2858 2898 2909-2914 2982-2987 3003-3008 3010 3039-3040 3043-3050 3055-3063 3087-3091 3093 3116-3117 3179-3180 3209-3211 3213-3215 3223-3224 3262-3264 3358-3359 3416 3448 3473 3577 3728 3730 3732 3743 3893-3898 3913-3915 3937-3940 3954 3992 4003-4005 4016 4048-4049 4053 4066 4174 4191 4207 4209 4218 4220 4282 4316 4320-4323 4325 4329-4330 4336-4340 4392-4395 4516 4582-4585 4604-4605 4696 4814-4815 4847-4853 4872-4873 4884-4885 4892 4899 4928-4929 4940-4941 4943-4944 4948-4951 4978-4980 4985 4996 5010-5013 5069-5070 5099-5101 5107-5115 5117 5333-5335 5401-5404 5406-5407 5410 5531-5533 5645-5648 5654-5656 5667-5670 5694 5705 5752-5754 5807-5810 5841-5846 5848-5850 5861 5875-5878 5934-5935 5937-5938 6131-6132 6177 6181-6182 6198-6200 6206-6211 6231-6233 6256 6311-6313 6337-6338 6545-6546 6567 6698-6700 6709 6735 6849 6903 6906 6915 6917-6918 6920-6923 7002 7007-7010 7031 7098-7107 7109 7118 7121-7122 7231 7241 7251-7252 7321-7322 7377-7379 7393-7395 7440 7443-7445 7453-7460 7462-7465 7469 7479-7480 7517 7542 7659 7664-7665 7708 7719 7771-7772 7774 7808-7810 7821 7893-7894 7987 8024 8034-8035
bone marrow	Clontech	BMD004	7 9-11 178-179 722-723 747 973 2136 2341-2344 2389-2390 2455-2458 2955 4053 4066 4183-4185 4892 5818-5820 6922-6923 7377-7379 7808-7810 7893-7894

Tissue Origin	Tissue/ RNA Source	Library Name	SEQ ID NO:
bone marrow	Clontech	BMD007	28-29 363-364 460 474-475 552-554 1540 2106-2108 2136 2425-2427 2672-2673 2677 2682 2765 2822 4053 4066 5137 5141 5980 5991 6002 6012 6024 6922-6923 7186 7197 7453-7460 7469 8034-8035
adult colon	Invitrogen	CLN001	66 77 311-314 323-327 404-407 476 478-479 484-485 663-664 823-825 844-845 872-874 969 979 1036 1110 1112 1177-1179 1213-1214 1216-1218 1279-1281 1371 1380 1391 1395-1399 1402 1410 1523-1524 1528 1565-1566 1628-1633 1635 1642-1643 1657-1663 1705 1715-1717 1727 1747-1748 1751-1754 1867 1895-1901 1923-1924 1926-1929 1974 2039-2040 2081-2083 2102 2162-2163 2389-2390 2428 2430-2432 2466-2469 2699-2704 2710 2712 2792 2795 2808-2812 2900-2908 2955 3081 3092 3103 3114 3179-3180 3278-3279 3310 3732 3741-3742 3840-3842 3979-3985 4238 4336-4340 4369-4371 4436 4537-4539 4571-4574 4618-4619 4726-4729 4734-4735 4737-4739 4777 4805-4808 4810 4837 4976-4977 5155 5212-5215 5225 5298 5401-5404 5406-5407 5531-5533 5631-5632 5638 5696-5699 5761-5763 5789-5790 5918-5919 5952-5954 6022 6025-6029 6163 6171-6173 6181-6182 6235-6237 6284 6331 6333-6335 6353 6356-6358 6450-6451 6453 6525-6529 6578-6579 6681 6687-6688 6721 6973-6977 6988-6989 7087-7089 7340 7453-7460 7587-7589 7790 7942 7989-7990
mixture of 16 tissues-mRNAs*	various vendors*	CTL016	297-298 426-427 477 488 528-529 552-554 658 722-723 988 994 1037-1040 1042-1043 1124-1125 1146-1148 1904-1905 2284-2286 2563 3039-3040 4526-4527 4659-4663 4952 4954-4958 5594 5605 5616 5627 6755-6758 7377-7379 7808-7810
mixture of 16 tissues-mRNAs*	various vendors*	CTL021	7 28-29 294 376 378-381 436-441 476 478-479 484-485 533-535 552-554 844-845 852-853 1299-1301 1585-1586 2016-2022 2136-2137 2185-2186 2204-2205 2207-2208 2284 2377-2378 2535-2538 2540-2543 3171-3172 3234-3235 3548 3560 4256-4258 4892 4952 4954-4958 5107-5115 5117 5599-5602 5694 5705 6109 6260-6265 6267-6274 6420 6422 6574 6585 6915 6917-6918 6939-6942 7377-7379 7453-7460 7808-7810 7841-7842
mixture of 16 tissues-mRNAs*	various vendors*	CTL028	4017-4020 7808-7810
adult cervix	BioChain	CVX001	9-11 21 28-29 40-44 55-56 66 77 80-87 89-98 100-109 112-117 122-124 178-179 181-183 202-203 215-217 229-232 246-248 250-259 261-264 268 270-273 311-314 318-320 323-325 333 335-339 360-361 374 382-383 398 400 404-409 432 442-443 445-454 456 466 476 478-479 486-487 489 492-493 501-504 506 514-515 517 522-524 538-539 541-542 550 555-556 571 573-582 586-593 595-596 602 607-612 630-633 635-636 645 647-649 658-662 666 668 670-671 704-706 708 722-725 727-728 747 753 768-769 771-772 774-775 780-781 785 816 818 820-821 837 854-856 858-863 867 869 880-881 884-885 905-909 911-912 915-917 923-927 937 939-943 954 959 969-970 973 979 990-993 995-997 1019 1021 1030-1035 1041 1052 1056-1057 1063 1068-1072 1083 1089 1096-1103 1111 1114-1118 1122 1124-1125 1129-1130 1140 1165 1167-1172 1174-1176 1183 1185-1190 1194 1204 1211-1212 1221-1225 1227-1230 1236-1237 1254-1256 1267-1268 1286-1287 1289 1291-1293 1303-1304 1314-1316 1328-1331 1334-1336 1341-1344 1355-1359 1361-1363 1369-1370 1372-1373 1377-1379 1382-1390 1395-1399 1408 1416-1418 1423-1426 1428 1430 1446 1457-1460 1462-1465 1470-1471 1473-1478 1503-1504 1506-1507 1515 1534-1535 1543-1547 1549 1560 1564-1566 1572-1575 1580 1591 1595 1621-1623 1640-1643 1657-1663 1674 1676-1678 1690-1693 1695-1696 1698-1699 1703-1709 1716 1718 1727 1755-1760 1762-1763 1768-1771 1773-1774 1782-1789 1799-1804 1820 1825-1831 1836-1837 1839-1843 1845 1847-1848 1850-1851 1861-1867 1870 1874-1880 1882-1890 1895-1901 1907-1909 1931-1934 1946 1948-1951 1974 2010-2011 2013 2016-2022 2039-2040 2076 2085-2086 2088-2093 2105-2108 2110-2112 2124-2127 2137 2147-2156 2158-2159 2162-2166 2169-2174 2177-2178 2180 2188-2195 2197-2200 2204-2205 2207-2208 2216 2218 2230-2238 2240-2242 2284 2322-2327 2341-2344 2347-2350 2352-2356 2359-2361 2401-2406 2408-2410 2412-2417 2419-2423 2428 2430-2434 2452-2458 2480 2494-2499 2503 2505-2506 2515-2516 2518-2527 2533 2551-2552 2555 2557-2565 2569-2571

Tissue Origin	Tissue/ RNA Source	Library Name	SEQ ID NO:
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diaphragm	BioChain	DIA002	229-232 335-337 385-386 436-441 708 923-927 1006-1009 1211-1212 1299-1301 1498 1541-1542 2806-2807 3560 4250-4255 4884-4885 6763 7289-7290 7987
endothelial cells	Stratagene	EDT001	9-11 21 24-25 28-29 36 40-45 47 49-51 55-56 66 77-79 168-169 178-179 191-195 215-217 229-233 237-239 246-248 250-259 261-266 268 270-273 282-284 311-320 323-325 329-331 335-337 340-341 344 349-361 365-373 375 377 387-400 404-409 423 426-431 433-449 455 461-465 467-468 477 486-489 492-493 500 508-515 517-524 528-529 545-546 552-554 567-570 574-580 584-585 593 595-600 602-604 606-614 616 618-620 622 624 627-629 637-640

Tissue Origin	Tissue/ RNA Source	Library Name	SEQ ID NO:
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Tissue Origin	Tissue/ RNA Source	Library Name	SEQ ID NO:
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Genomic clones from the short arm of chromosome 8	Genomic DNA from Genetics Research	EPM001	2251-2252 2254-2263 2266-2275 2277-2281 2994-2997 3533-3536 3538-3547 3549-3558 3916-3921 3923-3932 3934-3936 4765 4776 4787 4798 4809 4821 4832 4843 4854 4865 4876
Genomic clones from the short arm of chromosome 8	Genomic DNA from Genetics Research	EPM003	2251-2252 2254-2263 2266-2275 2277-2281 2994-2997 3533-3536 3538-3547 3549-3558 3628-3629 3916-3921 3923-3932 3934-3936
Genomic clones from the short arm of chromosome 8	Genomic DNA from Genetics Research	EPM004	2251-2252 2254-2263 2266-2275 2277-2281 2994-2997 3533-3536 3538-3547 3549-3558 3628-3629 3916-3921 3923-3932 3934-3936 4765 4776 4787 4798 4809 4821 4832 4843 4854 4865 4876 5928 7023
esophagus	BioChain	ESO002	28-29 40-42 164-165 477 488 622 624 1110 1112 1115 2232-2233 3567 5752-5754 5918-5919 7289-7290 7808-7810 8024
fetal brain	Clontech	FBR001	178-179 323-325 1116-1118 1202-1203 1205-1207 1395-1399 1409 1428 1430 1486-1488 1694 1697 1701-1702 1737 1739-1740 1782 2024-2026 2147-2152 2710 2712 2899 2919 3023 3025 3087-3091 3093 3116-3117 3150 3322 3585-3586 3717-3718 3720-3722 3732 3867-3870 4021 4329-4330 4341 4805 4884-4885 4906 5641-5642 5760 5771 5782 6702-6703 6934-6937 7587-7589 7790
fetal brain	Clontech	FBR004	40-42 53 658 880-881 1022 1114 1355-1359 1361-1363 1667-1670 1729 1763 1772 1850 1861-1863 1870 1872-1873 1965-1967 2162-2163 2332-2339 2352-2356 2454 2494 2511 2793 2936-2937 3003-3008 3575-3576 3579-3580 3696 3698-3702 3893-3898 3909-3910 3912 3937-3940 4513-4514 4529 4845 4856-4860 5590 6636-6638 7113-7115 7161 7808-7810 8044-8046

Tissue Origin	Tissue/ RNA Source	Library Name	SEQ ID NO:
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fetal brain	Clontech	FBRs03	1400 1690 2638 3042 5149 6198 7366 7377-7379 7808-7810
fetal brain	Invitrogen	FBT002	40-42 47 60 69-73 178-179 210-212 237-239 265-266 311-314 335-337 360-361 374 387 389-397 466 477 486-489 500 541-542 603-604 606-614 616 627-629 654-655 744-745 826-827 841-845 872-874 900 902 969 973 979 999-1000 1087-1088 1090-1094 1110 1112 1119 1156-1162 1164 1174-1175 1191-1193 1195-1196 1221-1225 1227 1241-1242 1264-1265 1305-1306 1308-1309 1314-1317 1319 1338 1346-1348 1350-1359 1361-1363 1369 1376-1379 1381 1395-1399 1405-1406 1415 1428 1430 1432-1439 1442-1445 1479-1481 1484-1485 1523-1524 1528 1534-1535 1552-1558 1562-1563 1601 1603 1612 1614-1619 1638-1641 1686-1693 1695-1696 1700 1703-1704 1706 1718 1730-1731 1763 1765-1767 1790 1792-1794 1823-1824 1844 1874-1876 1895-1901 1904-1905 1911-1913 1930-1934 1938-1940 1962 1996-2000 2010-2011 2013 2024-2033 2035-2036 2041 2052 2094-2097 2099-2100 2106-2108 2128-2129 2131-2134 2147-2152 2164-2166 2169-2174 2177-2178 2180-2181 2234-2238 2240-2242 2289-2294 2322-2327 2374 2381-2382 2385 2395-2400 2407 2418 2429 2437 2448 2459 2463 2466-2470 2480 2482

Tissue Origin	Tissue/ RNA Source	Library Name	SEQ ID NO:
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fetal heart	Invitrogen	FHR001	229-232 903-904 1124-1125 1239 1305-1306 1308-1309 1355-1359 1361-1363 1690 2204-2205 2207-2208 2533 2638 3039-3040 3506 4053 4066 4320-4323 4325 4969-4971 5752-5754 7289-7290 7641-7643 7771-7772 7987
fetal kidney	Clontech	FKD001	9-11 66 71-72 77-79 196-198 200 229-232 246-248 250-259 261-264 309 335-337 397-398 400 432 450-454 456 476-479 483 486-489 500-504 506 514-515 517 525-526 538 552-556 567-570 602-604 606 645 658 726 753 769 856 872-874 884-885 923-927 954 959 973 999-1000 1006-1010 1051 1101-1103 1124-1125 1131 1151 1192-1193 1195-1196 1213-1214 1216-1218 1221-1225 1227 1264-1265 1286 1318 1327 1338 1355-1359 1361-1363 1371 1380 1391 1395-1399 1402 1408-1413 1462-1465 1470-1471 1534-1535 1559 1561 1563 1648-1652 1680 1694 1697 1768-1771 1904-1905 1936 1947 2016-2022 2076 2102-2105 2110-2112 2137 2177-2178 2180 2200 2204-2205 2207-2208 2284 2322-2327 2350 2359-2361 2455-2458 2496-2497 2575 2638 2678-2682 2708 2744-2745 2750-2753 2762-2764 2767-2768 2787 2792 2808-2812 2898 2909 2940 2973-2974 2982-2987 3039-3040 3094-3095 3101-3102 3104-3105 3111 3116-3117 3122 3212 3219 3222 3230 3233 3311-3313 3325 3332-3333 3439 3468-3469 3499-3501 3521-3523 3575-3576 3579-3580 3583 3600 3695 3713-3714 3726 3749 3763 3777 3799 3817-3819 3890 3900-3901 3956 3998-3999 4055-4056 4091-4097 4231 4260-4264 4332 4369-4371 4465 4472 4523 4618-4619 4628-4631 4633-4642 4644-4649 4698 4710 4744 4747 4791 4847-4853 4972 4978-4980 5124-5126 5128-5130 5149 5151 5162 5204-5205 5207 5216 5218-5221 5233 5336 5338 5356 5399 5510 5540-5542 5590 5594 5605 5616 5627 5872 5875-5878 5918-5919 5956 5961 6022 6025-6029 6103 6108 6124-6128 6413-6414 6641-6642 6696 6837 6839-6848 6857-6859 6861-6862 6973-6977 7014 7098-7107 7109 7119 7175 7230 7238 7280 7285 7296 7307 7318 7329 7342 7353 7370 7377-7379 7423 7425-7426 7441 7587-7589 7634-7635 7706 7808-7810 7839 7841-7845 7967 8012-8016
fetal kidney	Clontech	FKD002	28-29 318-320 385-386 426-430 477 488 552-554 686-688 690-691 1056-1057 1070-1071 1087-1088 1090-1094 1124-1125 1173 1264-1265 1424-1426 1825-1826 1828-1831 1874-1876 2204-2205 2207-2208 2359-2361 5051-5052 5654-5656 7377-7379 7425-7426 7808-

Tissue Origin	Tissue/ RNA Source	Library Name	SEQ ID NO:
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fetal lung	Clontech	FLG001	40-42 335-337 602 617 666 668 722-723 979-985 999-1000 1056-1057 1341-1344 1370 1372-1373 1448-1449 1451-1456 1499 1691-1693 1695-1696 1703-1704 1706 1711-1713 1782 1910 2016-2022 2039-2040 2118 2120-2123 2204-2205 2207-2208 2230-2231 2234-2238 2240-2242 2282-2283 2363-2365 2425-2427 2664-2665 2667 2690-2694 2730-2733 2787 2982-2987 3095 3230 3328 3330 3468-3469 3499-3501 3521-3523 3717-3718 3720-3722 4053 4066 4083-4085 4236 4351 4473 4575 4577-4579 4628-4631 4633-4642 4644-4649 4703 4745 4847-4853 4892 4917-4918 4921-4926 4948-4951 5455 5613-5615 5617-5618 5628 5694 5705 5873-5874 6035 6046 6057 6413-6414 6515 6681 6984-6987 7289-7290 7367 7425-7426 7437-7438 7839 8010-8011 8044-8046
fetal lung	Invitrogen	FLG003	19 201 237-239 309 311-314 329-331 338-339 360-361 426-427 433 444 455 545-546 658-662 708 710-719 757-764 766 844-845 883 892 900 902 946-948 979 1001 1031-1035 1073-1080 1165 1177-1179 1243-1245 1355-1359 1361-1363 1395-1399 1408 1462-1465 1549 1560 1562 1604-1606 1640-1641 1657-1663 1705 1716 1727 1755-1760 1762 1773 1775-1777 1843 1974 2016-2022 2039-2040 2124-2129 2131-2134 2136 2284 2345-2349 2363-2365 2389-2390 2428 2430-2432 2528 2539 2545 2556 2567 2638 2682 2706-2708 2730-2733 2750-2753 2787 2808-2812 2898 2909 3039-3040 3078-3080 3082-3086 3101-3102 3104-3105 3151-3155 3209-3211 3213-3215 3356-3357 3457 3468-3469 3628-3629 3738 3741-3742 3764-3765 3791-3794 3806-3807 3809-3810 3913-3915 3937-3940 4016-4020 4053 4066 4091-4097 4114-4120 4136-4142 4144-4146 4150-4153 4157-4162 4164-4171 4218 4220 4307 4351 4377 4606 4659-4663 4667 4837 4847-4853 4872-4875 4877-4880 4917-4918 4921-4926 4981-4984 4986-4989 5090-5093 5095 5131-5132 5142-5143 5212-5215 5807-5810 5862-5868 5870 5977-5978 5987-5988 6147 6304 6404-6406 6413-6414 6454 6491 6850 6899-6900 6913 6933 6973-6977 6991 7012-7013 7016 7087-7089 7126 7186 7191 7197-7203 7256 7377-7379 7570 7600 7602 7609-7610 7676 7678-7680 7696 7698-7700 7808-7810 7874-7879 7954
fetal lung	Clontech	FLG004	265-266 476 478-479 552-554 1056-1057 1165 1365-1368 1424-1426 1552-1558 1690 2699-2704 3260-3261 7118 7121
fetal liver-spleen	Columbia University	FLS001	1 3 7 9-12 14 26-30 39 45 47 49-51 55 66 71-72 77-87 89-98 100-109 112-117 119-121 123-124 144 155 166-167 178-179 199 201-207 210 215-217 222-234 237-243 246-248 250-259 261-266 268 270-279 281-284 295-301 309 311-314 318-320 323-337 340-341 344 349-361 363-383 385-400 404-407 411-420 422 426-456 460 466 476-483 486-489 495-497 500-504 506-515 517-526 528-532 536-538 540-549 551-558 567-571 573-580 584-593 595-604 606-616 618-624 627-645 649-655 658-666 668 672-676 679-681 686-688 690-694 704-708 722-723 729-730 751-753 755 757-764 766-768 771-775 779-785 795 806 816 818-827 829-837 840-849 854-863 867-869 872-874 876-879 883-885 887-891 900 902 905-909 911-913 915-917 919-921 923-927 929-930 932 934 939-943 945 949-950 954 960-961 963-970 973-976 978-985 990-993 995-997 999-1013 1015-1019 1023 1031-1035 1037-1040 1042-1043 1049-1050 1053-1057 1063 1070-1072 1083-1086 1089 1095 1100-1103 1111 1114-1125 1127-1129 1131-1136 1140 1146-1148 1156-1162 1164-1165 1167-1172 1174-1179 1182-1191 1194 1198-1201 1204 1208-1209 1211-1214 1216-1225 1227-1232 1250-1251 1253-1257 1263-1265 1267-1268 1279-1281 1284-1285 1287 1289-1295 1297-1301 1303-1306 1308-1317 1319 1322-1325 1328-1331 1334-1337 1339-1344 1346-1348 1350-1359 1361-1363 1365-1368 1377-1379 1381-1387 1392-1400 1404 1408 1411-1415 1420-1421 1423-1428 1430 1438-1440 1442-1445 1447 1458-1460 1462-1465 1470-1471 1473-1477 1479-1481 1486-1493 1495-1496 1498-1499 1503-1504 1506-1509 1514-1515 1517 1520 1523-1524 1529-1533 1536 1538 1540-1542 1548 1552-1559 1561 1564-1569 1571 1576-1601 1603-

Tissue Origin	Tissue/ RNA Source	Library Name	SEQ ID NO:
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fetal spleen	BioChain	FSP001	28-29 385-386 450-454 456 552-554 593 595-596 649 730 1056-1057 1264-1265 1498 2185-2186 2232-2233 2345-2346 4516 4554 4565 4576 5416 5427 6161-6162 6735 7231 7241 7252 7808-7810 7966
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infant brain	Columbia University	IBM002	218-220 426-427 476 478-479 970 1119 1211-1212 1264-1265 1409 1657-1663 1667-1670 1681-1684 1732-1736 1846 2097 2099-2100 2114-2117 2380 2494 2682 2762 3107 3221 3311 3449-3450 3452 4022 4044 4046 4377 4475 4623-4624 4693 4765 4776 4787 4798 4809 4821 4832 4843 4845 4854 4865 4876 5050 5125-5126 5128-5130 5365 6531 6681 6711-6712 6761 6902 7131 7808-7810
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lung, fibroblast	Stratagene	LFB001	233 267 318-320 329-331 344 355 366 375 377 388 397 399 426-427 431 433-435 444 448-449 455 461-465 467-468 476 478-479 492-493 500 518-524 584-585 602-604 606 613-614 616 618-620 627-629 647-649 659-662 666 668 679-681 704-706 722-723 744-745 769 773 780-782 784 795 806 833-835 859-862 945 959 969 973 1011-1013 1018-1019 1021 1024-1028 1030 1037-1043 1052 1058-1061 1063 1070-1072 1083 1089 1100-1103 1111 1115 1122 1129 1131 1137-1145 1182 1184-1190 1192-1193 1195-1196 1211-1212 1221-1225 1227 1236-1237 1284-1285 1291-1293 1305-1306 1308-1309 1355-1359 1361-1363 1371 1380 1391 1395-1399 1402 1410 1428 1430 1447-1449 1451-1456 1458-1460 1470-1471 1503-1504 1506-1507 1517 1529-1535 1562 1565-1566 1611 1621-1622 1642-1643 1701-1704 1706 1782-1789 1832-1834 1843 1845-1846 1848 1851 1866 1877-1880 1882-1886 1888-1890 1904-1905 1935 1946 1948-1951 1996-2000 2016-2023 2034 2039-2040 2081-2083 2124-2127 2137 2143 2162-2163 2204-2205 2207-2208 2216 2218 2225-2226 2322-2327 2341-2346 2350 2363-2365 2381-2382 2389-2390 2401-2406 2408-2410 2428 2430-2432 2454 2528 2533 2539 2544-2546 2549-2552 2556 2567 2625-2626 2628-2634 2638-2640 2679-2688 2690-2693 2708 2742-2745 2774-2776 2781-2783 2785-2787 2789-2792 2794-2795 2827 2829 2835 2837 2938-2939 2941-2942 2945 2955 2962-2971 3043-3050 3071-3072 3078-3080 3082-3091 3093-3094 3101-3102 3104-3105 3123-3125 3156-3158 3184

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lung tumor	Invitrogen	LGT002	9-11 16-17 25 28-29 36 44 46-48 55 71-76 78-87 89-98 100-109 112-121 123-124 155 164-166 178-179 201-203 215-220 223-228 233 237-239 246-248 250-259 261-264 268 270-273 282-284 297-298 311-314 318-320 323-331 335-337 340-341 349-351 365 367 374 385-386 397-398 400 426-431 433-435 444-447 455 466 477 483-489 495-497 501-504 506 508-515 517-524 528-529 545-546 555-556 567-571 573 584-592 602-604 606-612 617 627-633 635-640 649 658 663-664 672-673 686-692 700 704-709 720 724-725 727-729 731 742 747 757-764 766 769 771-772 774-775 780-781 822-825 833-835 840-849 851 854-855 857-858 864-869 872-874 876-877 879 883-885 890 892 910-912 919-921 923-927 930 939-943 949-950 960-961 963-965 967-970 973 979-985 987 999-1000 1006-1009 1011-1017 1024-1028 1031-1040 1042-1043 1051 1054-1055 1058-1061 1063 1070-1072 1081 1083 1089 1096-1103 1111 1115-1123 1129 1131-1135 1137-1148 1151 1165 1167-1172 1183 1191 1194 1198-1207 1210-1214 1216-1218 1221-1225 1227-1230 1238 1250 1253 1264-1265 1267-1268 1279-1281 1283 1299-1301 1305-1306 1308-1309 1314-1316 1338-1340 1355-1359 1361-1363 1365-1368 1371 1377-1380 1382-1384 1391 1395-1399 1402 1410-1413 1415 1419 1423-1427 1438-1439 1442-1445 1447-1449 1451-1460 1476-1477 1479-1481 1498 1500 1510-1513 1529-1533 1549 1560 1564-1566 1576-1582 1591 1596-1601 1603 1611 1615-1619 1628-1633 1635 1640-1644 1646 1648-1652 1671-1673 1681-1684 1686-1699 1703-1704 1706 1711-1713 1718-1725 1737 1739-1740 1755-1760 1762-1763 1768-1771 1773 1775-1777 1780 1782-1794 1798 1806 1809 1836-1843 1845 1867 1877-1887 1892 1895-1901 1911-1918 1922-1935 1946 1948-1957 1960-1961 1968-1969 1971-1972 1974 1976 2002-2008 2010-2011 2013-2022 2024-2033 2035-2036 2038-2062 2066-2075 2077-2086 2088-2093 2101 2103-2105 2114-2117 2124-2127 2137-2144 2146 2155-2159 2164-2166 2168-2170 2179 2181-2200 2204-2208 2216-2218 2228 2232-2242 2244 2251-2263 2265-2275 2277-2281 2285-2286 2319-2327 2332-2339 2345-2346 2350 2352-2356 2359-2361 2363-2365 2374 2381-2382 2385 2387-2388 2396 2401-2410 2412-2423 2425-2435 2437 2439-2444 2448 2459 2466-2470 2480 2482-2492 2495-2503 2505-2506 2515-2516 2518-2527 2533 2544 2546 2549-2550 2553-2555 2557 2564-2565 2569-2571 2575-2577 2584-2586 2588-2589 2595-2597 2603-2605 2613-2615 2617-2620 2629-2636 2638 2641-2644 2674-2676 2682-2686 2688 2690-2697 2699-2704 2708 2710 2712 2714-2715 2729-2733 2738 2746 2750-2753 2757 2763 2778-2783 2785-2787 2789-2792 2795 2803-2804 2808-2820 2823-2824 2835 2837-2838 2842-2843 2846 2851 2900-2908 2910-2914 2922 2924 2934-2935 2938-2939 2941-2942 2945 2952-2955 2973-2977 3002-3008 3011-3012 3014-3015 3039-3040 3042-3050 3056-3063 3087-3091 3093 3095 3101-3102 3104-3105 3108 3116-3117 3123-3125 3134-3135 3151-3158 3195-3196 3206 3212 3217-3219 3222-3224 3226 3233 3236-3237 3260-3264 3266 3278-3279 3286 3289-3295 3297 3310 3313 3326-3327 3332-3333 3337 3353 3412-3415 3421 3431-3432 3438-3439 3449-3450 3452 3458-3459 3465 3485 3491-3493 3496-3498 3506-3507 3515 3517-3519 3526 3560 3584 3590-3596 3598-3599 3617 3620-3624 3626 3631 3635 3639-3656 3658-3667 3669-3672 3674 3677-3678 3688 3695 3713-3714 3719 3728 3730

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leukocyte	Clontech	LUC003	8-11 25 36 40-42 52 55 66 71-72 77 80-87 89-98 100-109 112-117 223-228 246-248 250-259 261-264 274-277 282-284 368-373 385-386 398 400 433 444 455 466 476 478-479 483 486-487 489 492-493 500 552-554 627-629 685 704-706 732-741 743 844-845 1005 1056-1057 1070-1071 1082 1115-1118 1133-1136 1146-1148 1156-1160 1185-1190 1236-1237 1291-1295 1297-1298 1355-1359 1361-1363 1385-1387 1395-1399 1424-1426 1458-1460 1499-1502 1517 1549 1560 1783-1789 1848 1851 1922 1977-1978 1980-1989 1991 1996-2000 2010-2011 2013-2015 2106-2108 2114-2117 2136-2137 2171-2174 2185-2186 2204-2205 2207-2208 2345-2346 2359-2361 2428 2430-2434 2445-2447 2460 2498-2499 2533 2564-2565 2580-2583 2595-2597 2632-2634 2638 2763 2898 2909 2982-2987 3039-3040 3070 3298 3355 3407 3411 3418 3429 3463 3499-3501 3521-3523 3575-3576 3579-3580 3610-3612 3713-3714 3763 3799 3845-3846 3909-3910 3912 3979-3985 4048-4049 4060-4062 4102-4103 4286 4357 4368 4379 4389 4400 4436 4484-4485 4568 4633-4642 4644-4649 4654 4688-4689 4734-4735 4777 4814-4815 4884-4885 4910 5087 5136-5137 5141 5342-5349 5351-5352 5462-5463 5560 5562 5571 5645-5648 5671 5675-5676 5812-5813 5815 5920 5962-5963 5987-5988 5998-6001 6022 6025-6029 6079 6090 6110 6120-6122 6153-6154 6181-6182 6260-6265 6267-6274 6441 6550 6552 6765 6795 6800 7011-7013 7016 7244 7261 7377-7379 7668 7670-7675 7771-7772 7808-7810 7817 7819 7969-7973 7984-7986 7988-7990 8044-8046
melanoma from cell line ATCC #CRL 1424	Clontech	MEL004	9-11 25 28-29 36 60-65 178-180 233 267 315-320 404-409 428-430 433 442-444 450-456 461-465 467-468 500 514-515 517-521 541-542 552-554 571 573 584-585 603-604 606 618-620 637-640 666 668 670-671 726 732-741 743 757-764 766 833-835 851 915-917 969 973 987-988 991-997 1018-1019 1058-1062 1120-1121 1123-1125 1131 1136 1167-1172 1176 1185-1190 1250 1253 1288 1355-1359 1361-1363 1377-1379 1381 1395-1399 1424-1426 1428 1430 1448-1449 1451-1456 1484-1485 1489-1493 1495-1496 1517 1541-1542 1572-1575 1648-1652 1657-1663 1680 1686-1689 1765-1767 1772 1782-1790 1792-1794 1843 1845 1868-1869 1877-1880 1882-1886 1903-1905 1922 1968-1969 1971-1972 2010-2011 2013 2038-2040 2081-2083 2085-2086 2088-2091 2105 2143 2162-2163 2181 2234-2238 2240-2242 2289-2294 2345-2346 2350 2359-2361 2381-2382 2425-2427 2433-2434 2450-2451 2503 2505-2506 2564-2565 2580-2583 2638 2646-2654 2656-2665 2667 2674-2676 2682 2744-2745 2781-2783 2785-2787 2795 2798-2802 2827 2829 2856 2865 2876 2982-2987 3043-3050 3071-3077 3081 3087-3093 3103 3111 3114 3116-3117 3123-3125 3212 3218 3220 3222-3224 3233-3235 3286 3342 3416-3417 3419 3439 3454-3456 3458-3459 3499-3501 3560 3600 3683 3713-3714 3717-3718 3720-3722 3743 3796 3802 3821-3822 3867-3870 3887 3891 3899 3954 4015 4133 4183-4185 4286 4309-4310 4336-4340 4344-4345 4347-4349 4357 4368 4372 4379 4415 4425 4440 4465 4488 4561 4628-4631 4671-4672 4702 4781-4784 4813 4817 4838-4841 4904 4907-4908 4910 4973 5014-5017 5056-5060 5062 5131-5132 5136-5137 5141 5303 5336 5520-5522 5577 5594 5605 5616 5627 5657-5659 5661-5663 5677-5680 5694 5705 5715 5717-5718 5814 5823 5825 5836 5847 5851-5852 5858 5873-5874 5914 6088 6143-6144 6153-6154 6260-6265 6267-6274 6336 6420 6422 6450-6451 6453 6479 6506-6507 6509 6583-6584 6586-6587 6643 6702-6703 6727 6755-6758 6804 6806 6851-6855 7108 7116 7120 7168 7194-7195 7408 7419 7461-7465 7472

Tissue Origin	Tissue/ RNA Source	Library Name	SEQ ID NO:
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Tissue Origin	Tissue/ RNA Source	Library Name	SEQ ID NO:
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induced neuron cells	Stratagene	NTD001	40-42 246-248 250-259 261-266 335-337 411-420 422 428-430 555-556 567-570 613-614 616 703 771 854-855 858 872-874 915-917 969 1006-1009 1018 1056-1057 1063 1072 1083-1085 1089 1100 1111 1122 1129 1140 1264-1265 1291-1293 1382-1384 1395-1399 1529-1535 1615-1619 1657-1663 1701-1702 1718 1772 1783-1790 1792-1794 1843 1847 1864-1865 1996-2000 2016-2022 2024-2026 2081-2083 2105-2108 2204-2205 2207-2208 2220-2223 2322-2327 2332-2339 2345-2346 2350 2363-2365 2369-2370 2575 2625-2626 2628 2638 2641-2642 2672-2673 2679-2682 2742-2743 2792 2798-2802 2835 2837 2919 2938-2939 2941-2942 3011-3012 3014 3039-3040 3056-3063 3096 3116-3117 3123-3125 3134-3135 3150-3155 3230 3354 3395 3560 3617 3889 3958-3964 3977 3990 4017-4020 4087 4089-4090 4256-4258 4289 4329-4330 4406 4446-4449 4547-4548 4571-4574 4623-4624 4664 4666 4781-4784 4802 4811 4827-4831 5137 5141 5272 5274 5448 5563 5566-5569 5631-5632 5644 5654-5656 5694 5705 5791-5792 5794-5799 5908-5909 6022 6025-6029 6092 6186-6188 6191 6198 6260-6265 6267-6274 6294 6360 6413-6414 6424-6427 6658-6660 6662-6666 6727 6883 7049-7051 7130 7146 7328 7375 7377-7379 7386 7441 7641-7643 7790 7808-7810 7996
retinoic acid-induced neuronal cells	Stratagene	NTR001	9-11 28-29 178-179 323-325 431 434-441 477 486-489 559-560 562 666 668 844-845 949-950 969 1070-1071 1146-1148 1174-1175 1264-1265 1299-1301 1355-1359 1361-1363 1783-1789 1843 2200 2345-2346 4102-4103 4748 4791 5272 5274 7291-7293 7771-7772 7808-7810
neuronal cells	Stratagene	NTU001	28-29 71-72 80-87 89-98 100-109 112-118 340-341 368-373 477 488 501-504 506 552-554 584-592 666 668 686-688 690-691 707 826-827 841-845 854-855 858 872-874 900 902 911-912 919-921 949-953 956 963-965 967-968 1006-1009 1011-1013 1015-1018 1056-1057 1124-1125 1156-1160 1243-1245 1264-1265 1299-1301 1303-1304 1346-1348 1350-1359 1361-1363 1438-1439 1442-1445 1458-1460 1552-1558 1572-1575 1587-1588 1601 1603 1621-1622 1703-1704 1706 1747-1748 1751-1754 1845 1862-1863 1895-1901

Tissue Origin	Tissue/ RNA Source	Library Name	SEQ ID NO:
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pituitary gland	Clontech	PIT004	66 77 318-320 382-383 461-465 467-468 518-521 613-614 616 649 666 668 980-985 1056-1057 1165 1202-1203 1205-1207 1228-1230 1257 1284-1285 1303-1304 1576-1578 1648-1652 1654 1701-1702 1711-1713 1749 1783-1789 1849 1857 1977-1978 1980-1989 1991 2002-2008 2039-2040 2106-2108 2234-2238 2240-2242 2345-2346 2350 2533 2553-2554 2563-2565 2575 2629-2631 2638 2682 2787 3096 3151-3155 3212 3218 3222 3233 3422 3499-3501 3521-3523 3560-3561 3602 3613 3732 3788-3790 3867-3870 3902 3976 3996 4024-4025 4035-4039 4391 4445 4549-4550 4552-4553 4625 4664 4666 4668-4669 4703 5125-5126 5128-5130 5136 5203 5452-5454 5478-5480 5681 5987-5988 5998-6001 6130 6183 6220-6221 6862 7062 7186 7197 7790 7871-7872 8044-8046
placenta	Clontech	PLA003	205-206 282-284 385-386 552-554 844-845 1124-1125 2124-2127 2204-2205 2207-2208 2955 3026-3034 3036-3038 3732 4091-4097 4326-4328 5654-5656 5841-5845 6319-6320 6322-6330 6450-6451 6453 7808-7810
prostate	Clontech	PRT001	40-42 214 233 282-284 318-320 408-409 426-427 436-441 450-454 456 500 518-521 567-570 581-582 584-585 593 595-596 618-620 637-640 647-649 658 672-673 707 726 732-741 743 872-874 969 1005 1031-1035 1037-1040 1042-1046 1056-1057 1086 1101-1103 1115 1165 1167-1172 1191 1221-1225 1227-1230 1258 1261 1305-1306 1308-1309 1355-1359 1361-1363 1365-1368 1382-1384 1411-1413 1416-1419 1447 1473-1475 1500 1541-1547 1550-1551 1559 1561 1580 1591 1612 1614-1619 1644 1646 1674 1676-1678 1686-1689 1737 1739-1740 1775-1777 1783-1789 1823-1826 1828-1831 1843 1862-1863 1887 1904-1905 1910 1922 1941-1945 1968-1969 1971-1972 2010-2011 2013 2084-2086 2088-2091 2118 2120-2123 2136-2137 2144 2201-2203 2216 2218 2345-2346 2350 2359-2361 2389-2390 2425-2428 2430-2432 2450-2451 2464-2465 2480 2495 2500-2502 2533 2544 2546 2549-2552 2558-2562 2584-2586 2588-2589 2627 2706-2707 2742-2745 2787 2789-2791 2795 2823-2824 2842-2843 2922 2924 2943-2944 2955 2982-2987 3095 3116-3117 3227-3229 3271-3272 3303 3305 3313 3398-3400 3436-3437 3485 3499-3501 3517-3519 3585-3586 3588-3589 3631 3679 3681 3732 3736-3737 3739 3755-3757 3766 3777 3783-3784 3802 3828 3851-3852 4063 4067-4068 4072-4074 4183-4185 4286-4288 4341 4355-4356 4358-4360 4387 4392-4395 4401 4404-4405 4433 4443 4464 4466-4467 4473 4505-4508 4628-4631 4650 4699-4701 4703 4753 4755-4756 4774-4775 4937-4939 4959-4962 4997-4998 5002-5006 5008-5009 5056-5060 5062 5090-5093 5095 5137 5141 5171-5172 5174-5175 5399 5420 5435 5457 5526 5573 5583 5610-5611 5949 5962-5963 5966-5967 6004 6007 6069 6198 6202-6203 6235-6237 6292 6333-6335 6443-6446 6479 6612 6687-6688 6735 6771 6782 6794 7087-7089 7238 7248 7284 7286-7287 7377-7379 7462-7465 7482 7499 7624-7627 7667 7738-7739 7928-7930 7932-7933 7987 8001 8034-8035 8044-8046
rectum	Invitrogen	REC001	40-42 123-124 265-266 282-284 323-327 387 389-396 404-409 411-420 422-423 476 478-482 484-487 489 500 518-521 559-560 562 586-592 617 674-676 744-745 747 823-825 841-843 892 896-899 969 979 990 1022 1036 1115-1118 1120-1121 1123 1213-1214 1216-1218 1447 1479-1481 1563 1572-1575 1580 1591 1604-1606 1612 1614 1640-1643 1657-1663 1679 1686-1697 1703-1704 1706

Tissue Origin	Tissue/ RNA Source	Library Name	SEQ ID NO:
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salivary gland	Clontech	SAL001	2 55 110 178-179 181-183 221 237-239 246-248 250-259 261-264 282-284 321 323-325 328-331 335-337 340-343 345-348 476-479 484-485 488 508-513 545-546 552-554 649 663-664 708 747 773 784 795 806 838 844-845 859-862 872-874 1019 1036 1049 1081 1133-1135 1165 1202-1203 1205-1209 1211-1212 1303-1304 1328-1331 1346-1348 1350-1359 1361-1363 1427 1462-1465 1498 1657-1663 1681-1684 1698-1699 1730-1731 1772 1782 1843 1845 1877-1886 1892 1895-1901 1931-1934 2010-2011 2013 2039-2040 2136 2141 2146 2157 2168 2179 2187 2196 2206 2217 2228 2232-2242 2244 2253 2265 2352-2356 2359-2361 2363-2365 2504 2510 2517 2544 2546 2549-2550 2555 2557 2564-2565 2575 2600-2601 2638 2682 2690-2693 2699-2704 2787 2842-2843 2846 3011-3012 3014 3039-3040 3043-3050 3095 3116-3117 3160-3168 3179-3180 3212 3222 3233 3323 3398-3400 3425-3428 3431-3432 3560 3575-3576 3579-3580 3626 3639-3645 3647-3656 3658-3667 3670-3672 3696 3698-3702 3749 3799 4002 4009 4035-4039 4207 4209 4218 4220 4265 4357 4368 4379-4382 4389 4400 4487 4598 4625 4696 4726-4727 4737-4739 4745 4796-4797 4814-4815 4817 4884-4885 4976-4977 5082 5166-5167 5270-5272 5274 5337 5455 5482 5484-5485 5501-5504 5506-5509 5537 5539 5645-5648 5654-5656 5761-5763 5833-5834 5873-5874 5934-5935 5937-5938 6163 6293 6411 6443-6446 6547-6548 6771 6782 6794 6851-6854 7453-7460 7487-7489 7512 7779-7780 7808-7810 7922-7923 7993-7995
salivary gland	Clontech	SALs03	484-485 613-614 616 887-889 891 1355-1359 1361-1363 2510 2517 6684 6695 7377-7379 7580 7590 7601 7612 7622 7633
skin fibroblast	ATCC	SFB001	903-904 1355-1359 1361-1363 1874-1876 2533 2638 2682 2744-2745 3212 3222 3233 3260-3261 3417 3419 4526-4527 4561 6198 6260-6265 6267-6274
skin fibroblast	ATCC	SFB002	584-585 903-904 1058-1061 1317 1319 1355-1359 1361-1363 1621-1622 2395 2397-2400 2638 3212 3222 3233 4102-4103 4369-4371 4526-4527 4745 5694 5705 6198 6260-6265 6267-6274
skin fibroblast	ATCC	SFB003	477 488 584-585 1231-1232 1355-1359 1361-1363 2016-2022 4526-4527 5918-5919 6198
small intestine	Clontech	SIN001	80-87 89-98 100-109 112-117 210 476 478-479 484-485 501-504 506 514-515 517 552-554 584-585 617 686-688 690-691 707 722-723 726 732-741 743 747 829-832 841-843 872-874 878 887-889 891 900 902 905-909 915-917 962 969 980-985 1005 1070-1071 1176 1247-1249 1286 1339-1340 1346-1348 1350-1354 1392-1394 1409 1420 1473-1475 1681-1684 1690 1703-1704 1706 1737 1739-1740 1775-1778 1796-1797 1848 1851 1881 1892 1895-1901 1935 2016-2023 2034 2137 2230-2231 2352-2356 2359-2361 2401-2406 2408-2410 2494 2564-2565 2613-2615 2708 2750-2753 2774-2776 2803-2804 2839-2841 2851 2855 2930-2931 2938-2939 2941-2942 2955 3020-3022 3144-3146 3149 3217 3255 3299-3302 3362 3385 3396 3422 3499-3501 3520 3560 3605 3614 3639-3645 3647-3656 3658-3667 3670-3672 3675 3717-3718 3720-3722 3732 3777 3803 3904-3905 3988-3989 4002 4201-4202 4271-4272 4281 4341 4433 4443 4445 4461 4490 4554 4565 4576 4607-4609 4611-4613 4628-

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skeletal muscle	Clontech	SKM001	7 178-179 229-232 246-248 250-259 261-264 323-325 332 334 404-407 428-430 476-479 488 627-629 744-745 748-749 771 773 784 795 806 863 878 880-881 887-889 891 900 902-904 911-912 919-921 990 1146-1148 1273-1275 1299-1301 1370 1372-1373 1395-1399 1498 1517 1596-1600 1714 1730-1731 1755-1760 1762 1845 1887 1895-1901 2027-2033 2035-2036 2105 2188-2195 2197-2199 2234-2238 2240-2242 2425-2427 2452-2453 2466-2469 2529-2531 2584 2716-2717 2744-2745 2950 2961-2972 2980 2991 3276 3430-3432 3468-3469 3548 3560 3581-3582 3615-3616 3937-3940 4010-4011 4016 4172-4173 4176 4244-4245 4320-4323 4325 4373-4374 4446-4449 4455 4650 4708 4711 4728-4729 4737-4739 4847-4853 4897 4969-4973 5441 5478-5480 5591-5593 5595-5596 5752-5754 6040-6042 6092 6443-6446 6553-6554 6601 6605 6715-6716 6933 7123-7125 7190 7289-7290 7512 7517 7551-7553 7738-7739 7779-7780 7987 8024
skeletal muscle	Clontech	SKM002	584-585 887-889 891 903-904 1888-1890 3548 3592-3596 6260-6265 6267-6274
skeletal muscle	Clontech	SKMS03	584-585 887-889 891 903-904 1888-1890 7551-7553
skeletal muscle	Clontech	SKMS04	887-889 891 903-904 1198-1201 1888-1890 2638 4847-4853 7098-7107 7109
spinal cord	Clontech	SPC001	9-11 40-42 53 66 71-73 77 80-87 89-109 112-117 123-124 133 178-179 194-195 246-248 250-259 261-264 282-284 311-314 328 335-337 375 382-383 397 411-420 422 426-427 433 444-447 455 476-479 488 500 508-515 517 528-529 545-546 552-554 584-585 597-600 602 630-633 635-636 647-648 659-662 666 668 686-688 690-691 708 729 771 780-781 876-877 923-927 929 959-961 969 973 979 988 994 999-1000 1002-1003 1006-1009 1031-1035 1063 1072-1080 1083 1089 1100 1111 1114-1115 1122 1124-1125 1129 1136 1140 1202-1203 1205-1207 1241-1242 1299-1301 1305-1306 1308-1309 1341-1344 1346-1348 1350-1359 1361-1363 1365-1368 1395-1399 1448-1456 1461 1472 1484-1485 1499 1525 1528 1534-1535 1612 1614 1621-1622 1648-1652 1657-1663 1665-1666 1698-1704 1706 1718 1732-1736 1738 1747-1748 1750-1760 1762-1763 1775-1777 1783-1789 1836-1837 1839-1843 1845 1862-1863 1866-1867 1874-1876 1895-1901 1910 1923-1924 1926-1929 1935 1938-1940 1965-1967 1977-1978 1980-1989 1991 1996-2001 2010-2013 2016-2023 2034 2039-2041 2052 2063 2118 2120-2123 2136 2143 2153-2154 2216 2218 2220-2223 2234-2238 2240-2242 2276 2289-2294 2319-2321 2345-2350 2352-2356 2359-2361 2466-2469 2494 2509 2534-2538 2540-2543 2551-2552 2558-2562 2564-2565 2575 2579 2584-2586 2588-2589 2632-2634 2638 2679-2686 2688 2690-2693 2714-2715 2772 2787 2798-2804 2813 2823-2824 2839-2841 2856 2865 2876 2921 2930-2931 2933 2946-2948 2950-2951 2955 2961-2972 2980 2982-2987 2989-2993 3020-3022 3039-3040 3052 3056-3063 3078-3080 3082-3091 3093 3095 3101-3102 3104-3105 3116-3117 3120 3150-3155 3183 3194 3203 3221 3223-3224 3234-3235 3246-3248 3299-3302 3347 3350 3363 3374 3393 3433-3434 3454-3456 3499-3502 3506 3521-3523 3560 3605 3681-3682 3713-3714 3762 3791-3794 3806-3807 3809-3810 3814 3832-3833 3853-3854 3856-3859 3862-3865 3867-3870 3887 3909-3910 3912 3986 3990 3998-3999 4010-4011 4064 4102-4103 4126 4183-4185 4193 4230 4241 4248 4287-4288 4373-4374 4396 4429 4464 4466-4467 4473 4483 4490 4549-4550 4552-4553 4587 4590-4591 4599 4610 4633-4642 4644-4649 4651-4653 4655-4658 4732 4749 4838-4841 4847-4853 4884-4885 4893-4896 4899 4906 4952 4954-4958 4978-4980 5002-5006 5008-5009 5094 5118-5120 5138 5144-5146 5156-5161 5163 5173 5184 5195 5206 5216 5218-5221 5223 5228-5232 5236-5240 5329-5330 5333-5335 5376-5380 5435 5441 5452-5454 5462-5463 5478-5480 5497 5534-5536 5631-5632 5634 5636 5667-5670 5694 5705 5707 5713-5714 5786 5862-5868 5870 5872 5979 5981-

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thalamus	Clontech	THA002	168-169 349-354 356-361 374 382-383 432 436-441 476 478-479 528-529 538 581-582 603-604 606 645 666 668 744-745 753 757-764 766 780-781 816 818 841-843 856-857 868 879 890 945 954 963-965 967-969 979 1073-1080 1120-1121 1123 1165 1185-1190 1202-1203 1205-1209 1290-1293 1305-1306 1308-1309 1374-1375 1385-1387 1395-1399 1478 1628-1633 1635 1640-1641 1665-1666 1691-1693 1695-1696 1703-1704 1706 1730-1731 1746 1763 1790 1792-1794 1796-1797 1845 1881 1892 1904-1905 1923-1924 1926-1929 1931-1934 1965-1967 1996-2000 2188-2195 2197-2199 2204-2205 2207-2208 2289-2294 2347-2349 2352-2356 2359-2361 2383-2384 2386 2425-2427 2535-2538 2540-2543 2564-2565 2575-2577 2682 2690-2693 2716-2717 2737 2739-2741 2772 2781-2783 2785-2786 2853-2854 2857-2858 3087-3091 3093 3096 3101-3102 3104-3105 3229 3234-3235 3310 3358-3361 3364-3373 3375-3384 3386-3388 3449-3450 3452 3491-3493 3495 3499-3501 3513 3601 3603-3604 3715 3788-3790 3843 3853-3854 4035-4039 4138-4142 4144-4146 4250-4255 4309-4310 4320-4323 4325 4369-4371 4373-4374 4392-4395 4416-4417 4491-4493 4616-4617 4842 4844 4847-4853 4952 4954-4958 4965 5069-5070 5168-5169 5272-5274 5284 5409 5443 5540-5541 5657-5659 5661-5663 5678-5680 5913 6148-6152 6195-6196 6209-6211 6249-6250 6306-6309 6368-6369 6394 6421 6432 6450-6453 6708 6727 6761 6837 6839-6848 6915 6917-6918 6943-6947 6988-6989 7029-7030 7049-7051 7179-7180 7222 7328 7400-7405 7587-7589 7647 7677 7686 7697 7736 7874-7879 7943 7993-7995
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thymus	Clontech	THMc02	6 9-11 20-21 55 61-66 77 80-87 89-98 100-109 112-118 122-124 164-165 196-197 223-233 246-248 250-259 261-266 318-320 360-361 368-374 387 389-396 432 448-454 456 476-479 488 495-497 501-504 506 514-515 517 525-526 533-535 538 545-546 552-554 586-593 595-596 607-612 645 649 658 663-664 670-671 686-688 690-691 704-706 708 710-719 732-741 743 753 757-764 766 771 780-781 822 844-845 856 884-885 900 902 919-921 929 949-950 954 973-976 978-985 988 994 1005 1024-1028 1031-1035 1049 1054-1055 1065-1067 1087-1088 1090-1094 1115 1120-1121 1123-1125 1127-1128 1133-1135 1156-1160 1174-1175 1183 1192-1196 1198-1201 1204 1210 1221-1225 1227 1231-1232 1264-1265 1279-1281 1284-1285 1314-1316 1334-1336 1355-1359 1361-1363 1365-1368 1371 1380 1382-1384 1391-1394 1402 1410 1422 1424-1426 1428 1430 1448-1449 1451-1456 1462-1465 1486-1488 1498 1501 1503-1504 1506-1507 1510-1513 1543-1547 1552-1559 1561 1572-1578 1587-1588 1595 1611 1640-1641 1648-1653 1680-1684 1686-1689 1703-1704 1706-1709 1711-1713 1737 1739-1740 1782-1789 1807 1820 1827 1836-1837 1839-1842 1862-1863 1872-1873 1881 1892 1895-1901 1904-1905 1914 1925 1935 1975 2010-2011 2013 2024-2033 2035-2036 2039-2040 2081-2086 2088-2091 2110-2112 2128-2129 2131-2134 2143 2147-2152 2171-2174 2188-2195 2197-2199 2204-2205 2207-2208 2230-2231 2234-2238 2240-2242 2285-2286 2288-2294 2345-2349 2352-2356 2359-2361 2374 2385 2387-2394 2396 2407 2412-2423 2425-2427 2429 2437 2439-2444 2448 2454 2459 2464-2465 2470 2482 2490-2491 2504 2511 2515-2516 2518-2527 2558-2562 2595-2597 2607-2611 2613-2615 2617-2626 2628-2631 2635-2636 2641-2642 2668-2670 2682-2686 2688 2690-2693 2708 2718-2721 2723-2725 2729 2738 2742-2743 2746 2757 2764 2767-2768 2772 2781-2783 2785-2786 2798-2804 2808-2812

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thyroid gland	Clontech	THR001	28-29 44-45 55 144 178-179 205-206 229-233 246-267 269 280 318-320 323-327 332 334-337 340-341 349-354 356-361 365 367 374 376 378-381 385-387 389-398 400 408-409 428-432 434-443 445-449 461-465 467-468 476 478-479 514-515 517 522-526 528-529 536-540 550 552-554 559-560 562 574-582 586-593 595-596 602 607-612 617 622 624 630-633 635-640 645 647-649 654-655 657-658 666 668 670-676 685 704-707 710-719 722-723 747 753 768 770-772 774-775 780-782 840-845 851 854-856 858 872-874 878 880-881 884-885 900 902-909 911-912 914-917 923-927 929 938-943 954 963-965 967-970 973 979 999-1000 1002-1003 1005-1009 1015-1020 1031-1035 1037-1040 1042-1043 1054-1057 1063 1068-1069 1072 1081 1083 1087-1094 1100-1103 1110-1112 1115 1119-1123 1129-1130 1136 1140 1165 1167-1173 1176 1183 1192-1196 1204 1210 1213-1214 1216-1218 1228-1230 1236-1237 1246-1249 1257 1283 1291-1293 1303-1304 1314-1317 1319 1322 1328-1331 1341-1344 1349 1355-1359 1361-1363 1370 1372-1375 1382-1390 1395-1399 1404 1411-1413 1415-1419 1424-1426 1446-1449 1451-1456 1458-1460 1462-1465 1476-1477 1486-1488 1498-1499 1503-1504 1506-1507 1510-1513 1515 1536 1538 1562 1565-1566 1580 1591 1595 1601 1603 1611 1627 1653 1657-1663 1679 1690-1693 1695-1696 1698-1699.1701-1706 1711-1713 1716 1727 1730-1731 1738 1750 1755-1760 1762-1763 1772-1773 1775-1777 1779 1781-1790 1792-1794 1796-1797 1820 1825-1831 1843 1845 1857 1871 1877-1880 1882-1887 1895-1901 1904-1905 1911-1918 1922-1929 1931-1935 1962 1974 1992-2000 2002-2008 2010-2011 2013-2022 2024-2033 2035-2036 2039-2040 2081-2083 2085-2086 2088-2091 2102-2109 2114-2117 2136-2138 2143 2147-2156 2158-2159 2162-2163 2171-2174 2181 2188-2195 2197-2203 2209-2214 2216 2218 2220-2223 2225-2227 2229-2238 2240-2242 2251-2252 2254-2263 2266-2281 2289-2294 2328 2330 2332-2339 2341-2344 2350 2352-2356 2359-2361 2371-2372 2375 2381-2384 2386 2391-2394 2425-2428 2430-2432 2435 2439-2444 2449-2454 2464-2465 2476-2478 2480 2490-2491 2507 2512-2514 2529-2531 2533 2535-2538 2540-2543 2551-2554 2563-2565 2569-2571 2576-2577 2584-2598 2600-2601 2629-2631 2635-2636 2639-2642 2672-2676 2679-2682 2695-2697 2708-2709 2716-2717 2750-2756 2758-2760 2763-2764 2767-

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trachea	Clontech	TRC001	19 54 56 178-179 360-361 365 367 450-454 456 484-485 500 586-592 603-604 606 613-614 616-617 657-658 663-664 674-676 747 782 837 872-874 893-895 914 938-943 980-985 1070-1071 1101-1103 1115-1118 1137-1139 1141-1145 1156-1160 1174-1175 1219-1220 1236-1237 1291-1293 1303-1304 1338 1411-1413 1419 1424-1427 1450 1461 1472 1604-1606 1621-1622 1694 1697 1796-1797 1845 1856 1990 2010-2011 2013-2015 2102 2118 2120-2123 2136 2155-2156 2158-2159 2220-2223 2289-2294 2345-2346 2350 2363-2365 2439-2444 2492 2498-2499 2555 2557 2580-2583 2585-2586 2588-2589 2612 2632-2634 2674-2676 2694 2744-2745 2774-2776 2830-2833 2982-2987 3024 3035 3039-3040 3095 3097 3116-3117 3159 3170 3181 3183 3212 3222 3233 3262-3264 3313 3322 3332-3333 3491-3493 3520 3682 3732 3799 3815 3968 3978 3987 3997 4006 4114-4120 4135 4138-4142 4144-4146 4183-4185 4207 4209 4232 4237 4243 4249 4273 4287-4288 4373-4374 4380-4382 4422

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uterus	Clontech	UTR001	2 30 74-76 110 155 166 213 221 233 318-321 323-325 335-337 411-420 422 477 488 514-515 517 528-529 555-556 584-593 595-596 618-620 647-649 659-662 769 840 854-855 858 880-881 896-900 902 915-917 923-927 973-976 978 1018 1024-1028 1056-1061 1063 1072 1082-1083 1089 1096-1100 1111 1115 1122 1124-1125 1129 1131 1140 1166 1176 1183 1185-1190 1194 1202-1207 1284-1285 1303-1304 1355-1359 1361-1363 1395-1399 1423-1426 1476-1477 1505 1525 1611 1642-1643 1648-1652 1674 1676-1678 1690 1701-1702 1719-1725 1741-1745 1765-1767 1775-1777 1783-1789 1796-1797 1825-1826 1828-1831 1862-1863 1930 1992-1995 2010-2011 2013 2081-2083 2136 2153-2154 2177-2178 2180 2216 2218 2371-2372 2375 2381-2382 2428 2430-2432 2436 2438 2500-2502 2528 2539 2545 2556 2564-2565 2567 2572-2574 2585-2586 2588-2589 2682 2713 2774-2776 2781-2783 2785-2787 2795 2910-2914 3095 3226 3236-3237 3265 3328 3330 3347 3443 3485 3499-3501 3524-3525 3527-3529 3568-3571 3585-3586 3683 3758-3759 3761 3821-3822 3950 4024-4025 4147-4149 4172-4173 4176 4264 4287-4288 4298-4301 4303 4357 4368 4373-4374 4379 4392-4395 4424 4465 4473 4490 4575 4577-4579 4616-4617 4667 4673-4674 4747 4796-4797 4856-4860 4897 4978-4980 5078-5081 5099-5101 5138 5155 5204-5205 5207 5236-5238 5240 5376-5380 5401-5404 5406-5407 5418 5428-5430 5462-5463 5833-5834 5918-5919 6022 6025-6029 6055-6056 6058-6060 6069 6189 6245 6251-6252 6368-6369 6412 6545-6546 6675-6676 6732 6772 6983 7179-7180 7271 7326 7400-7405 7437-7438 7462-7465 7494 7504 7515 7526 7535 7546 7558 7569 7814 7829 7839 8034-8035

TABLE 2

SEQ ID NO: of nucleotide sequence	SEQ ID NO: of peptide sequence	Method	SEQ ID NO: in USSN 09/577,408	Nucleotide location corresp. to first residue of peptide sequence	Location of first nucleotide of codon corresp. to last residue of peptide sequence	Amino acid sequence (X= Unknown; *=stop codon; /=possible nucleotide deletion; \=possible nucleotide insertion)
1	8052	A	1	2	424	
2	8053	A	10	67	373	FCDCHHFILMFKSPHIWPVGIFSSWLLCFFWACLHHSLSIALLSCTKRYSGLILYFLCSSFEITVSSKSSVSF*RRMVFRNQVLGSRCACCC*GVAAPRPFP
3	8054	A	100	404	1072	ARACKIPNTASDRPIIVALQRKRSSPKMTQSAAGTCPTSCMIK/IDSHKCGDDRELFAQAPVDQFPGTAVESVTDSSRYFVIRIEDGNGRRAFIGIGFGDRGDAFDFNVALQDHFKWVKQQCEFAKQAQNPDQGPKLDLGFKEGQTIKLNIANMKKKEGAAGNPRVRPASTGGLSLLPPPPGGKTSTLIPPPGE/PVGCGGIPRPASSCSQFRSTSSQTQPGTGW
4	8055	A	1000	2	333	ACPFNKSAEDLLNL/RQGLTAGQLPFLPWWNIVLDSP/SLTSIPATSFSTSLATARARSASEVPIWKTTLFCSLSQVRKTTRSSGATKSTVLSTSLTTLLH*IILRSISSSQ
5	8056	A	1001	292	945	
6	8057	A	1002	46	493	
7	8058	A	1003	2	406	
8	8059	A	1004	192	548	
9	8060	A	1005	1	528	DNELLDYEDDEVETAAGGSMS/EAPAKKDVKGSYFSIHSSGFRDFLLKPELLRAIVDCGFEH\PSEV\QHECIPQAILGMDFLCQAKSGMGKTAVFVLATLQQLEPVTGQVSVLVMCHTRELAFQTR*KTRPFWNVTVCPSGEDTRVGVKETLLPPPLTAPTPWLPSFASPPLLNPHF
10	8061	A	1006	807	1034	
11	8062	A	1007	136	1520	LFTPCFHLFCENPSRSPFPSSPAGPVMAENDVDNE\LLDYER*MRWETAAGGDGAEAPAKKDVNGLLCLPSHSSGFRDFL\LKPELLRAI\VD\CGFEHPSEVQHECIPQAILGNGMSCARAKSGSGERQAVF\VLATLQQLEPV\TGQGVCAG*CCHTRELAFQISKEYERFSKYMPNVKVAVFFGGLSIKKDEEVLKKNCPHIVVGTPGRILALARNKSLNLKHIKHFILDECDKMLEQLDMRRDVQEIFRMTPHEKQVMMFSATLSKEIRPVCRKFMQDPMEIFVDDETKLTLHGLQQYYVKLKDNEKNRKLFDLLDVLEFNQVVIFVKSVQRCIALAQLLVEQNFPAIAIHRGMPQEERLSRYQQFKDFQRRILVATNLFGRGMDIERVNIAFNYDMPEDSDTYLHRVARAGRFGTKGLAITFVSDENDAKILNDVQDRFEVNISELPDEIDISSYIEQTR
12	8063	A	1008	92	191	
13	8064	A	1009	219	422	
14	8065	A	101	2	477	IVSPEVRWAPGVAMEESGYESVLCVKPDVHVYRIPPRATNRGYRAAEWQLDQPSWSGRLRITAKGQMAYIKLEDRTSGELFAQAPVDQFPGTAVESVTDSSRYF\VIRIEDGNGRRAFI*I\GFGDRGDAFDFNVALQDHFKWVKQQCEFAKQAQNPDQG
15	8066	A	1010	215	416	
16	8067	A	1011	261	486	GFLGKVLQSPATTVVRTLNDRSSIVMGEPISQSSSNSQ*FFFFKENSRILFCLG*CAVEQHFSSIFHCVDFYII

17	8068	A	1012	31	2697	
18	8069	A	1013	306	439	
19	8070	A	1014	149	404	
20	8071	A	1015	2	343	
21	8072	A	1016	172	341	
22	8073	A	1017	73	408	
23	8074	A	1018	53	237	
24	8075	A	1019	51	480	
25	8076	B	102	118	419	XLFCVDIDECSIMNGGCETFCTNSEGSYECSCQPGFALMPDQRSCTDIDECEDNPNICDGGQCTNIPGEYRCLCYDGFMASEDMKTCVDVNECDLNPNICLX*
26	8077	A	1020	49	399	
27	8078	A	1021	564	651	
28	8079	A	1022	2	366	SLPASDRPPISSPLATSGTIFSAISCFWDLPAPFLWLAPSCQPTMSSQIRQNYSTDVEAAVNSLVNLYLQASYTYLS\LQDIKKPAEDEWGKTPDAMKAAMALEKKLNQALLDLHALGSART
29	8080	A	1023	18	781	EICPSRPKNSARRGGPAGLSLASTVFGRNRSGDWASSLRPPSDFLLRLQPPGPSYRPSPASGTCQHRFLWLAPSCQPTMSSQIR\QNYSTDVEAAVNSL\VNLYLQASYTYLSLGFYFDRDDVALEGVSHFFRELAEEKREGY*RLLKMQNQ\RGGRALFQDIKKPAEDEWGKTPDAMKAAMALEKKLNQALLDLHALGSARTDPHLCDFLETHFLDEEVKLIKKMGDHLTNLHRLGGPEAGLGEYLFERLTLKHD
30	8081	A	1024	217	608	
31	8082	A	1025	147	430	
32	8083	A	1026	489	700	
33	8084	A	1027	899	1097	QPAGPSLTRCATAQALCTTLPPCCLVKQDGSTIHIRYREPR/QQCWRMPIDLDTLSPEERRARLRKR
34	8085	A	1028	59	426	
35	8086	A	1029	1	2148	
36	8087	A	103	59	450	CLGVTVKDVNQQEFVRALAA\F\LKKSGKLKVPEWL\DTVKLLAKHKELAPY\DENWFY/SREFVRNLASTARHL\YLRGGRWGLAPLTKIYGGDVQRKRAFIAPAIFSRG\SKSVARRVLQAL\EGLKMVEKDQD
37	8088	A	1030	193	564	GDSGGSPWPDEKPKEGVKTENNDHINLKVAG\Q\DGSVVQ\FKIKRHTPLSKLMKAYCE\RQGLSMRQIRFRI*PGNPIHETDTPAPVGKWKDERYQLMVFQQARPGGVYLKKGTCFFYSKNSVSF
38	8089	A	1031	216	372	
39	8090	A	1032	566	787	
40	8091	A	1033	2	401	
41	8092	C	1034	379	453	
42	8093	A	1035	2465	2795	
43	8094	A	1036	1264	1385	
44	8095	A	1037	1249	1457	
45	8096	A	1038	146	438	
46	8097	A	1039	2	2387	
47	8098	A	104	583	1526	PHLILQVTKAMCPFESGRESFLVVSICIYFKPDSSASFSFPDPYSVQC*PQLEPPPHCSTSIYFPK/PTLPHIPFPPPLLTKHPKEDLELAGWTSSGCFYFSLPSTKLGENWSLHPQSHVYRSGDLDVGSF*LLSQKL\HRNPSICSLKGPPPREGLGNDPVSTNTAPYPRNLP*DLQRTIFSSPSIFYPGPPGAPSGES*NP*ELEGILEVF*LELCPTE/VH*HQPGLVFPPPSGLFSSFPPPQKILTHRFLLVQASKPTPLPLRLCPLWSPSHPYPSSLAPSSSLEFGPGSPQKTL

						PLWSPSHPYPSSLAPSSSLEFGPGSPQKTLE*PPLPKKQTDRHAPGPE
48	8099	A	1040	1	1329	
49	8100	A	1044	3	581	
50	8101	A	1045	1	741	PLTRAAGIRHEDSQSVGNSSPEIPVLPEPAYQLGPLCQVLPRRAGSSCLPVMTRTVKLWDKSSRECVHSYCEHGGFVTYVDFHPSGTCIAAAGMDNTVKVWDVRTHRLLQHYQLHSAAVNGLSFHPSGNYLITASSDSTLKILDLMEGRLLYTLHGHQ\GPATTVAFSRTGEYFASGGSDEQVMVWKRNFDIGDHGEVTKVPRPPGTLASSMGNLTVSILEQRLTLTEDKLKQCLENQQLIMQRATP
51	8102	A	1046	526	1272	
52	8103	A	1047	57	307	
53	8104	A	1048	1669	1820	
54	8105	A	1049	212	547	
55	8106	A	105	1283	1648	SSGASVAPTSWTSNRFPP*SWVPSSF*RTHGPRPSGPPRERKPRAPGQEPTKGTPRESVCLNDLPCPGLLGICRPILQTSP/CHGHHGILSVVNVLKGDKPKSPRSLGLPVFHNHHFRDLSVL
56	8107	A	1050	670	1296	
57	8108	A	1051	243	335	
58	8109	A	1052	1	1170	
59	8110	A	1053	1	1122	
60	8111	A	1054	1	392	
61	8112	A	1055	47	296	
62	8113	A	1056	1	315	
63	8114	A	1057	1	579	
64	8115	A	1058	87	507	
65	8116	A	1059	866	1002	
66	8117	C	106	263	304	MLKLSVRNRETFL*
67	8118	A	1060	385	573	
68	8119	A	1061	328	530	
69	8120	A	1062	6	664	LPGRPTRAPTRPAEHSIVGTRLVSCQLQPSQPNADQGKLTTMRIAVICFCLLGITCAIPVKQADSGSSEEKQLYNKYPDAVATWLNPDPSQKQNLLAPQTLPSKSNESHDHMDDMDDEDDDDHVDSQDSIDSNDSDDVDDT\DDSHQSDESHHSDES\D\ELVTDFPTDLPATEVFTPVVPTVDTYDGRGDSVVYGLRSKSKKFRRPDIQYPDATDEDITS
70	8121	A	1063	2	613	PRVRPRVREEAEHSIVGTRLVSGQLQPSQPNADQGKLTTMRIAVICFCLLGITCAIPVKQADSGSSEEKQLYNKYPDAVATW\LNPDPSQKQNLLAPQN\AVSSEETNDFKQETLPSKSNESHDHMDDMDDEDDDDHVDSQDSIDSNDSDDVDDTDDSHQSDESHHSDESDELVTDFPTDLPATEVFTPVVPTVDTYDGRGDSVG

71	8122	A	1064	1	1073	TDCRVDPRVRPRVRVEHSIVGTRLVSCQLQPSQPNADQGKLTTMRIAVICFCLLGITCAIPVKQAES\GSSEEKQLYNKYPDAVATWLNPDPSQKQNLLAPQ\TLPSKSN\ESH\DHM\DDM\DDED\DD\DHVGTARDSIGLGTTLDGCRMDTGWIFHQF*WSLHHFWMESGWNWSLDFSPRDLAQATEVFQFQFVP\TVDTYDGRGDSVVYGLRSKSKKFRRPDIQYPDATDE\DITSHME\SEELNGAYKAIPVGPDPDAPSDWDSRGKDSYETSQLDDQSAETHSHKQSRLYKRKANDESNEHSDVIDSQELSKVSREFHSHEFHSHEDMLVVDPKSKEEDKHLKFRISHELDSASSEVN
72	8123	A	1065	1	1128	LETPIDSPRNRPGNPGATHASGRRQSTASSGPDSVSGQLQPSQPNADQGKLTTMRIAVICFCLLGITCAIPVKQADSGSSEEKQLYNKYPDAVATWLKP*PIFRRQNLLGPTEWLCPLKETNDFKQGGPFPS*GPTERPWTTWDDMG*WKVDGWTMWDSQDSIDS\NDSDDVDDT\DDSHQSDESHHS\DESDELVTGFSTDLPATEVFTPVVPTVDTYDGRGDSVVYGLRSKSKKFRRPDIQYPDATDEHITSHMESEELNGAYKAIPVAQDLNAPSDWDSRG\KDSYETSQLDDQSAETHSHKQSRLYKRKANDESNEHSDVIDSQELSKVSREFHSHEFHSHEDMLVVDPKSKEEDKHLKFRISHELDSASSEVN
73	8124	A	1066	514	1000	
74	8125	A	1067	1	1098	
75	8126	A	1068	2388	2658	FYKVTFMWKSKVKSLGDNFVLGSVVPCFLFFFFFFLRWSLALLPRLECSGAISAHCILCLPGSSNS/PASASQVVGITGTCHHAWLIFLYF
76	8127	A	1069	788	1000	
77	8128	A	107	426	1519	AWRRRRSGTSGKATWWCSGLRRASPTPSRRVQSWATAVMWKPSPSSSPASWE/PALPREPHRAVSEQRQ*GR*PCKPELTAPLCLEPVHRPEGPMGT/YSRCCLSPLHRP/PGPVGTFPV/SPEPVHRPQDPWHIPGVPEPVHRPQDPWHIPGVPEPVHRPQDPWHIPGVPEPVHRPQDPWHIPGVPEPVHAPTGPVALASVGASSRDGLLPAHAAACTLHETAGQTRTSRLSPS*GLGLPFCSRRSRQPWTPALGHSKTSGEWRGGARPGPCGC*CCMLSPTQQPLPGGHPQRARASPRAGEG*TSRAYLAVHAAATLWKLPLPEDPPPLLDARISAHRPLCPSGRHRKVSLFLTLSFSISCEARKIG
78	8129	A	1070	306	1195	
79	8130	A	1071	3	715	FVAHTKGVRGLPSMRRSPDCGRMELAAGSFSEEQFWEACAELQQPALAGADWQLLVETSGISIYRLLDKKTGLYEYKVFGVLEDCSPTLLADIYMDSDYRKQWDQYVKELY\EQECNGET\VVYWEVKYPFPMSNRDYVYLRQRRDLDMEGRKIHVILARSTSMPQLGERSGVIRVKQYKQSLAIESDGKKGSKVFMYYFDNPGGQIPSWLINWAAKNGVPNFLKDMARACQNYLKKT
80	8131	A	1072	1	1128	
81	8132	A	1073	3	862	
82	8133	A	1074	1	912	MTDNILELAQNMDKYTKYEMTTTSILSQPSSSQREQDGQGFQELTVTSEMFRKGKGSFCSHPHPEKFLRTFNEIETYLIGNFQDLELESSDDLPRGCTNEKARKTYDPKKLPLPYT/VRPCWILASKLHI*ESYG*RQ*A**CHQ*TPWPRPVWWSLHTEAHEIWCRDSDQGTSLGRSIPCPPVLCS*ERSTYDLR\PQTDQPSKHLTNLKSASTPPPYNPFITSPPHTRSGLQFRSTSSPPAPAQQFTLKKVAEAKGIVKVNAPFSLSDLSQISVRLGSFIKYEKSSPV

						KVNAPFSLSDLSQISVRLGSFIKYEKSSPV HGSFGSNPETLYSPRP
83	8134	A	1075	611	817	
84	8135	B	1076	1	1500	MRTREVSITGADFTALLVDIIGNSTSYLT EIFKSTSILSVNQSNESDCIFICVMTGKSG RNLSDFWEIEEKYPIINYTFTSGLSGVLAL LLTQSLFGGLFTRTRMKFGAVTRIGGPPL GNQSPSSCSLLHEKDPPTTSGPQTDQPKK HLTNFKSGTEEAMNTTSLLAPAAEIMAT PGSPSQASPTSGAFTHGTQTPSPTKATAP RYPQTGAQSRRPRRFRRPPAGAAPKAAA PRHPHPRGTAPPPRRISPESIRPHPPPPLDR GPRPPVTPFLIVLGCLILAVLTTFKEYETV SGDWLLLLETFAIFIFGAEFALRIWAAGC CCRYKGWRGRLKFARKPLCMLDIFVLIA SVPVVAVGNQGNVLATSLRSLRFLQILR MLRMDRRGGTWKLLGSAICAHSKELITA WYIGFLTLILSSFLVYLVEKDVPEVDAQG EEMKEEFETYADALWWGLITLATIGYGD KTPKTWEGRLIAATFSLIGVSFFALPAGIL GSGLALK*
85	8136	A	1077	606	1065	LVARTERLSVSQGFLPWCTGRIRSHVGL ENECKVLLSGSSSQKMGKPEGRWFSPGV GPPPCLAAPALLRLPWKSPPHPTGGWPA SVPVPVGVLFCQRAPLDDQLLVCWPAR VLEKRYWQPPLS*LCPSCAHHMNGYGS GAYVWVLTELTVDFAGFWA
86	8137	A	1078	1	822	MWNAVTLWQQRESCIEEESEIGTLETKE THFIRGPKTLAPVTDWEGSLPLVFNQCR DASLIIHPRFKGFRPRRDACLGPSPLAASP AFLGKGQAAPRQAELGPNSSSASAPPPY NPFITSPPHTWSGLQFHSMTSPPPPAQQF PLKKVAGAKGIVKRLKTDTARLPWKPP DHHRRRASGNSHSGRVQPP/CPAAFVGS C*VSQAFPGARCKLSVDLPFWDLED\RV FMCVRVKRPPNRLCVSNMAVYFTWVQL LQAIWAYTCKSQGMRWLGLGSEA
87	8138	A	1079	38	639	MTLIKSPIVIWTIRSRLKWSQMEMRNLL GTGAKRQRRHVLSVDPKLRRWSRTGKA AFPWCLIIAGRPALVLHP*QQVLLSWGR GKI*LTSPSRCTIIEKSCNSWPPL*DKPQP HLQHTRTSKRLNRSGQAFLQNLLPQELA TSTRN/PDHQAKECLQPRIPPKPCPICAGP HWKLDCSTHLAATPRAPGTLAQGSLTDS FSA
88	8139	A	108	1	537	RRCCCRHTRSPCLALLLEIVSLFSFAVPQ SPDSSPLVFTYFARTHPDPPSLLPLPAQL WQRTMWTMKLLDYER*MRWETAAGG DGAEAPAKKDVKGSYVS/LSHSSGFLDF LLLL*VLPSIVHCAFEHSTHFRHECISQAI LGKDALFPALLDIFLTGVFFLTIFSPVLRV LLRCLFCLS
89	8140	A	1080	1	1611	

90	8141	A	1081	17	1173	MADSRIKRTWMRMKFGAVTRIGGTSLGRSIPCPPALCSVKKIHLRPRVLRPTSPRNISPILN/TARFKRIKACYYSPATAWPFKAYKLPLQFPHFT/WS*NQTRLTA*FS*KHTCSP*LSSPANLPNPNPFYKTTTPFLPRHG**GQ\ILTQELGPRPIAFLSKQLDLTVLTQPSCLHAAAAAALILLKALKITKYAQLTLYSSHNFQNLFSSSYLMHILSAPWLLQLYSLFVESPTITIVPGTDFNPASHILDTTPDPHDCISLIHLTFTPFPRISFFPVPHPNHIWFIDGSSTRPKCHSPAKAGYAIVSSTSIIEATALPPSTTSQQAELVALTQALTLAKGLCVNIYTDSKYAFHIVHHHARSFLTKQGSSIINPSLIKTLLNAA
91	8142	A	1082	324	548	SFYHLPSSHWVLLTVSFRD*PSPTCPAIYS*KGGWSQRHSQGACYKCQKSGHWAKECPQPRIPPKLRPICVGPH
92	8143	A	1083	760	1260	HTDGVLVWMSFLFVSFPSNSQDPQLQLCWSLLEVHSRSCLPGYQQWRLSWKCRNHSSSASLTLRAVDWSCSYSAILEPRWYCLLYFIQSIILKKHRGRRWIFLMEQRTGGQRIDLPRGGPPI*VTAPNLMHVRVKRPPNRLCVSNKAVYFTSKSGPLSQDVVTVVIH
93	8144	A	1084	908	1192	
94	8145	A	1085	1	420	
95	8146	A	1086	287	515	LFTHVSKELATSARNLTTRPRTAGSPGFLLSHVPSVWDPTANRTVQLTWQPLPEPLE\SGPRLSD*LLPRSSRLSG
96	8147	A	1087	1	5127	
97	8148	A	1088	3	721	
98	8149	A	1089	144	408	
99	8150	A	109	1	457	AGGGCSPKGRPEAKSGQRDWELVAGGPPGISRREGTCCSRFPSRLSQPFRSAQQLQLAASLPANLSNFCQGSEMPTTSRPALDVKGGTSPAKEDARPEKSTLGQ/YSTLLVIDNQVSSKTR*PDESANQYYASDTFIILSRTYNRYILVHLSK
100	8151	A	1090	265	769	RQKRHVLSVDPKLRRWSRTGKAAFPWCLIIAGRPALVLHP*QQVLLSWGRGKI*LTSPSRCTIIEKSCNSWPPL*DKPQPHLQHTRTSKRLNRSGQAFLQNLLPQELATSTRN/PDHQAKECLQPRIPPKPCPICAGPHWKLDCSTHLAATPRAPGTLAQGSLTDSFSA
101	8152	A	1091	69	634	KQKRSTYNLRSSDPPAQETSHQFQIRDKGDTFYLWTQNSGAAHGLGRQPSLDV*SLQGHLSDYSPMFPRCQTMQGRLP*SFTLSGKSRFSGEGASTPQPLLHP*WQVPLFWGRGKYPSTPSSPLVASPAFLGKGQKPPRPSRMPSFG
102	8153	A	1092	1	655	MGATHPFELLTKMTSQGSDISGDLPWEINPLSSCSLLHEKDPPTTSGPQTDQPKKHLTNFKSETKETHFIRGPKTPVLVTDWEGRLPLVFNHSRDASLIIHPRFRGVRPRRDACLGPSPLAASPAFLEEGQVPQPLLSMSLTPSLLFWRRGKKPSTPSSPLAASPAFLEEGQVPQPHIS/GA/LDPLFLHPNLL*LCTPTPFPLFWKTVRKYSSNNQKGE
103	8154	A	1093	756	878	LSQWRSDNGPAFISQITQAVSQAPGIQ*NLYIPYHPQSSGK
104	8155	A	1094	781	1194	FPKGGPPI*VIAPNFMRVRVKRPPNRLCVSNKAVYFTWVQVGALCRLGA/PAPCIPAAPVP/VHGSEGPRYNSSRCLAELKP*ALAASMWYLSLKALGIESGRVSITAILINISSARKA/SCVPLGSRILESLMLSTVRALR
105	8156	A	1095	400	686	RQVLLFWGRGKYPSTPSPSPLAASPTFLGQGQELVTSARNLTTRPRNACGPGFLLSHVPSVRDPTGNRTVQLTWQPLPEPLE\SGP

						RLSD*LLLRL
106	8157	A	1096	1	883	MASSAQLLGSSQETYNHSKRQRGGEMSHMAGARRKRERGEMLHTFKQPDLMRWSSVCRKNKEKVGNSRKRRNVRYCFSRKFNGTSKVFESWQVVVVGEINSHVAHTKPVRWSLHTDAHEIWCRDSDRRTSLGRSIPCPPVLCSMRKIHLQAQVLRPTSPRNISPILNRRKRRHVLSVDPKLRHRSWTREGSLPLVFNLCRDASLIIHPGFRGVRPRRDTCLGPSPLAASPTFLGEGARACYKCQKSGHQAKECLQPRIPPKLCPI\WRDPAGNRTVQLTWQPLPKPLELWPKVL
107	8158	A	1097	2	551	CGKVWNFLETFSMALTKMLIMIWTMKFRLRSSQMEMRNLLGTGISLETWCPAS*PL*P*LKGDKIQLRPWLQRVQGQSIGSFQEVLGPWVLRNQELRFGNLCLYFAGCMEKPVCPGRSLLQGQGF/PWYVPVAVVGAKVHDVNLHMLSFPSKWKLHTCMKFGAVTWIRGPPLGDQSPVLLLFAP
108	8159	A	1098	1436	1699	
109	8160	A	1099	1099	1250	LVYLKVTGRMEPSWKTLCRILSRRTSPI*QGRPTFRFRKYREHHKDTPRD
110	8161	A	11	366	795	AWVEQSKVLIKEGGIQLLLTIVDTPGFGDAVDNSNCWQPVIKYFDSKSQD\YLNAESQVNRCQMPGNRV\HCCLYFIAPSGHGPLHN*RLPPSGRIG*YMFVTTWHCLLLRLKPLDIEFTKHLHEKVNIIPLIAKADTLMPEEC
111	8162	A	110	232	376	FPTTKSLG*DSFTSEFCQTFKAELIPILS/RLFQKLEQYVTLPYPFYEA
112	8163	A	1100	303	1413	VRRQRSDRERSDARMVRFCNLYM*RKNPFILH*LFR*TLRQTKPDSSA/V*MCQNLMTHSKSTEWKITK/QIFDGDGKTYQNVQQFIDEGNYTSGDNHTLRDPHYVEDKGHKYLVFEANTGTENGYQDSAHLHPGEINSHVAHTKPVWWSLHMDAHEIWCRDSDRGTSLGRSIPRPPALCSVRKIHLQPQVLRPTSPRNISPISNPGFCRFRNHHQTGFSPAGANQRGPLAATLSGPGGEGQSAVARLTGEKKNHPGAQYANRLSPRVGRFINAAGTTGFPTGKRAVSATQLMDFADFGTTTKQDFRLLGQTSVDRLLQLSQGQAVKGNQLLPVSLVKRKTTLAPNTQTASPRALADSLMQLARQVSRLESGQ
113	8164	A	1101	846	1825	
114	8165	A	1102	2141	2384	AEQWPSVKILRQELATSARNLATRPRNARSPGFLLSCVPSVWDPTGNQTVQLTWQPLPEPLE\SGPRLSD*PLPRCSRLSS
115	8166	A	1103	305	1148	
116	8167	A	1104	2779	3182	DKTQPHLLHTGTSKCLNCSGQAFLQNLLLQELATSARNLATRPGNSCSPGFLLSHVPSVPDPTGNRTVQLTWQPLPEPLELWPKVLSRVMDYI*MVY*STIPQNSAIVLTDLLLGVYIPSESKHARPKVVLWAH
117	8168	A	1105	2286	4921	
118	8169	A	1106	1	761	
119	8170	A	1107	1	969	

120	8171	B	1108	1	2175	MVNPDTGYINYDQLEENARLFHPKLIIAGTSCYSRNLEYARLRKIADENGAYLMADMAHISGLVAAGVVPSPFEHCHVVTTTTHKTLRGCRAGMIFYRKGGMAPLGTATLLQALFSLLFLSKSRDVPGTGADPGVMYVKRRPRGTDSGCGVLEPRRFLPSGMAFTKEEEYEEEPYNEPALPEEYSVPLFPFASQGANPWSKLSGAKFSRDFILISEFSEQVGPQPLLTIPNDTKVFGTFDLNYFSLRIMSVDYQASFVGHPPGSAYPKLNFVEDSKVVLGDSKEGAFAYVHHLTLYDLEARGFVRPFCMAYISADQHKIMQQFQELSAEFSRASECLKTGNRKAFAGELEKKLKDLDYTRTVLHTETEIQKKANDKGFYSSQAIEKANELASVEKSIIEHQDLLKQIRSYPHRKLKGHDLCPGEMEHIQDQASQASTTSNPDESADTDLYTCRPAYTPKLIKAKSTKCFDKKLKTLEELCDTEYFTQTLAQLSHIEHMFRGDLCYLLTSQIDRALLKQQHITNFLFEDFVEVDDRMVEKQESIPSKPSQDRPPSSSLEECPIPKVLISVGSYKSSVESVLIKMEQELGDEEYKEVEVTELSSFDPQENLDYLDMDMKGSISSGESIEGLGTEKSTSVLSKSDSQASLTVPLSPQVVRSKAALLQPHPNPTHRLRSSSMEYKPDPPHRFSEPWPNLEPEANLSSPAVKDSVTKELQTARPSREQT*
121	8172	A	1109	2	964	DIIPLVMVNPDTGYINYDQLEENARLFHPKLIIAGTSCYSRNL\EYARLRK\IADENGAYLMADMAHISGLVAAGVVPSPFEHCHVVTTTTHKTLRGCRAGMIFY\RKGVK\SVGSPRLGKEILYNLESLINSAVFPGLQGGPHNHA\IAGVAVAL\KQAMTLEFKVYQHQVVANCRALSEALTELGYKIVTGGSDNHLILVDLRSKGTDGGRAEKVLEACSIACNKNTCPGDRSALRPSGLRLGTPALTSRGLLEKDFQKVAHFIHRGIELTLQIQSDTGVRATLKEFKERLAGDKYQAAVQALREEVESFASLFPLPGLPDF
122	8173	A	111	515	909	LPLFIMNMTVELVWPDTTSNLPRNSEILSSPTRPNQLFVCLFLGSPSLPRLEYKWYSQSSL*PQNPGLK*SSPSASYVAKTTDMCHHAWLIFLFLQTEGL/NYIAQVG/VQTPGFKQSSCLTLPKC*DYRHEPP
123	8174	A	1110	172	375	
124	8175	B	1111	827	1276	MATAAWSSSLEKSYELPDGQVITIGNERFRCPETLFQPSFIGMESAGIHETTYNSIMKCDIDIRKDLYANNVLSGGTTMYPGIADRMQKEITALAPSTMKIKIIAPPERKYSVWIGGSILASLSTFQQMWISKQEYDEAGPSIVHRKCF*
125	8176	A	1112	144	261	
126	8177	C	1113	122	253	MGWVGTATSPHPVAWRTRRPSSLRSLPSVRALVVRTERRVPCG*
127	8178	A	1114	50	368	RQAILTAAPRRAAARAAVRSRHGGARALSPGMEQRRRR\RTTWSLLQPRPRRRWAARRPRGRRAQVARRTARRICPCGRPPPVRAPAADPWARRAWSTSRSPAGTE
128	8179	A	1115	336	689	
129	8180	A	1116	164	370	
130	8181	A	1117	974	1111	
131	8182	A	1118	179	404	FSSSIGSLRRQRRGMKTPFGKAAAGQRSRTGAGHGSVSVTMIKRKAAHKKHRSRPP\SQPRGNIVGCIIQHGWKDG
132	8183	A	1119	1	1698	
133	8184	A	112	40	351	LKIPMQFLHSGFWFSFFVFFGF*KFGFGPQGGRQGG\NKTKGEKLPPGSSSLPGPNPQENREKKGPPKTLKKFGNLSSSGGKTRG

						PRGEKNSDPKGTPGQNPGN
134	8185	A	1120	264	799	
135	8186	A	1121	231	351	
136	8187	A	1122	1	3654	
137	8188	A	1123	1376	3462	TKPKTKTTLLSQ*MQKKPLTKFNNPSC*KLSIN/IVLEVLARAIRQKKEIKGIQLGKEEVKLSLFADDMIVYLENPIVSAQNLLKLISNFSKVSGYKINVQKSQAFLYTKNRQTESQIMSELPFTIASKRIKYLGIQLTRDVKDLFKENYKPLLKEIKEDTNKWKNIPCSWVGRINIVKMAILPKVIYRFNAIPIKLPMTFFTELEKTTLKFIWNQKRARIAKSILSQKNKVGGITLPDFKLYYKATVTKTAWYWYQNRVIDQWNRKEPSEITPHTYNYLIFDKPEKNKQWGKDSLFNKWCWENWLAICRKLKLDPFLTPYTKINSRWIKDLNVRPKTIKTLEENLGITIQDIGMGKDFMSKTPKAMATKAKIDKWDLIKLKSFCTAKETTIRVNRQPTTWEKIFTTYSSDKGLISRIYNELKQIYKKKTNNPIKKWVKDMNRHFSKEDIYAAKKHMKKCSSSLAIREMQIKTTMRYYLTPVRMAIIKKSGNNRQTGSGVDLKQTPTDLKLRDLTVRRKMNKQKEIASTSTKRTSTPNPTCRSVGPKDCSSLGAMEQSWTENDFDKLTEKKALEENQEEMDKFLDTYTLPRLNQEEVESLNRPITGSEIEAIIDSIPTKKYPGPDGFTAKFYERIKVFCTESLAKWIKWTHTKTFIMEFHTIGNAKILQASSFTEVKTKTKTLEHKRLESIMALTSQ
138	8189	A	1124	485	2347	TEPKTKTT*LSQ*MQKRPLTKFNNTSC*KLSIN/IVLEVLARAIRQEKEIKGIQLGKEEVKVSLFADDMIVYLENPTVSAQNLLKLIGNFSKVSGYKINVQKSQAFLYTNNRQTERQIMSELPFTIASKRIKYLGIQLTRDVKDLFKENNKPLLKEVKEDTNEWKNIPCSWVGRINIVKMAILPKVIYRFNAIPIKLPMTFFTELEKTTLKFIWNQKRACIAKSIFSQKNKAGGITLPDFKLYYKATVTKTAWYWYQNRDIAQWNRTEPSEIMLHIYNYLIFDKPEKNKQWGKDSLFNKWCWENWLAICRKVKLDPFLTPYTKMNSRWIKDLNVRPKTIKTLEENLGITIQDIGVGKDFMSKTPKAMATKAKIDKWDLIKLKSFCTAKETTIRVNRQPTTWEKIFATYSSDKGLISRIYNELKQIYKKKTNNPIKKWAKDVNRHFSKEDIYAAKKHMKKCSSSLAIREMQIKTTMRYHLTPVRMAIIKKSGNNRKIQ/GGIWCDRIL*R*TTCRVAKEIQSL*RRI/WKRLQRTLSIPVLDAV*PPMF*ASVIDTMTI*CFEARDTCFTLTLESFWDMHRCLAASKGIGLLLC*PLIWHMSLMGVKSPPFVFSCLWTSAVRPTT
139	8190	A	1125	1	2784	
140	8191	A	1126	1	3000	
141	8192	A	1127	1	3045	
142	8193	A	1128	1	2736	MIISIDAEKAFGKVQQPFMLQTLNKLGIDGSYLKIIRAVYDKPTANITLNGQKLEAFPLKTGTRRGCPLSPLLFNIVLEVLARAIRQEKEIKGIQLGKEEVKLSLFADDMIVYLENPIVSAQNLLKLISNFSKVSGYKINVQKSQAFLYTNNRQTESQIMSELPFTIASKRIKYLGIHLTRDMKDLFKENYKPLLNEIKEDTNKWKNIPCSWVGRINIVKMAILP\RFNAIPIKLPMTFFTELEKTTLNFIWN/Q
143	8194	A	1129	1	2955	

144	8195	A	113	307	1429	CTATQSGWLCLHRPCPAWRCTWRTTWF CIRYKGEMVKVSRNYFSKLWLLYRYSCI DDSAFERFLPRVWCLLRRYQMMFGVGL LTRGTGLQGFAACCMSLRPSTDSLASVS ECFASPLNCYFRQYCSAFPDTDGYFGSR GPCLDFAPLSGSFEANPPFCEELHGCHGL SL*ETA*ELTGAPVPSSVFIPEWAGNPQH QRSPAWKQ/MPLQTPPVDPACL*A*VPQ WLPAHLQEGGNALQGRPQHGCALPTE/P TLALPSGRRRLTGCRS*VLPTGSPGP/PAT ALVLPHRSYLGGPRTGIRGREQGPKPRA SPHLTYSCGEEGAPGVLSLDLLGLGPLGP QRDPGCH*HMKIMVLPGLPSLPVPKSSP QTPSKSHVYRS
145	8196	B	1130	1	3105	MGKKQNRKTGNSKEQSTSPPPKECSSSP AREQSWTENDFDELREEGFRRSNYSELW EDIQTKGKEVENFEKNLEECITRITNTKK CLKELMELKTKARELREECRNLRSRCDQ LEERQINETESQQGYPGIELSSAPSGPNT HLQNSPPQINRIYIFSAPHHTYSKTDHILG SKALLSKCKRTEIITNYLSDHSAIKLELRI KNLTQSRSTTWKLNNLLLNDYWVHNE MKAEIKMFFETNENKDTTYQNLWDAFK
146	8197	A	1131	1	2826	MEYYAAIKNDEFMSFAGTWMKLGTIILS KLPQGQKTKHHMFSLTAPHHTYSKIDHII GSKALLSKCKRTEIITNYLSDHSAIKLELR IKKLTQNRSTTWKLTNLLLNDYWVHNE MKAEIKMFFETYENKDTTYQNLWDAFK AVCRGKFIALNAHKRKQKRSKIDILTSQL KELEKQEQTHSKANRRQEITKIRAELKEI ETQKTLQKINESRSWFFERINKIDRPLAR LIKKKREKNQIDAIKNDKGDITTDPTD
147	8198	A	1132	1709	2973	TEPKTKTT*LSQ*MQKRPLIKFSNASC*K LSIN/IVLDVLARAIRQEKEIKGIELGKEE VKLSLFADDMIVYLENPIVSAQNLLKLIS NFNKVSGYKINVQKSQAFLHTNNRQTES QITSELPFTIASKRRKYLGIQLTRDMKDL FKDNYKPLLNEIKEDTNKWKNIPCSWVG RINIMKMAILPKATVTETAWYWYQNRDI DQWNRTEPSEIMPRIYHYLIFEKPDKNK QWGKDSLFNKWCWENWLAICRKLKLD PFLTPYTKINSRWIKDLNVRPKTIKTLEE NLGNTIQDIGMGKDFMSKTPKAMATKA KIDKWDLIQLKSFCTAKETTIRVNRQPIE WEKIFANYSSDKGLISRIYNELKQVYKK KTNNPIKKWAKDMNRHFSKEDIYA\ANR HMKKCSRSLAIREMQIQTTMRYHLTPV
148	8199	A	1133	1	2856	
149	8200	B	1134	1	3786	MVKGSIQQEELTILNIYAPNTGAPRFIKQ VLSDLQRDLDSHTLIMGDFNNPLSTLDR SMRQKVNKDTQELNSALHQVDLIDIYRT LHHKSTEYRFFSAPHHTYSKIDHILGSKA LLSKCKRTEIITNYLSGHSAIKLELKIKNL TQNRSTTWKLNNLLLNDYWIHNEMKAE IKMFFETNENKDTTYQNLWDAFKAVCR GKFIALNAHKRKQERSKIDTLTSQLKELE KQEQTHSKAGRKKEITKIRAQLKEIETQ
150	8201	A	1135	1	3276	
151	8202	A	1136	1	3042	
152	8203	A	1137	1	3663	
153	8204	A	1138	1	3144	

154	8205	B	1139	1	3380	MVKGSIQQEELTILNIYAPNTGAPRFIKQ VLSDLQRDLDSHTLIMGDFNNPLSTLDR SMRQKVNKDTQELNSALHQVDLIDIYRT LHHKSTEYRFFSAPHHTYSKIDHILGSKA LLSKCKRTEIITNYLSGHSAIKLELKIKNL TQNRSTTWKLNNLLLNDYWIHNEMKAE IKMFFETNENKDTTYQNLWDAFKAVCR GKFIALNAHKRKQERSKIDTLTSQLKELE KQEQTHSKASRRINKIDRPLARLIKKKR
155	8206	A	114	161	218	
156	8207	A	1140	1	3345	
157	8208	A	1141	1	3429	
158	8209	A	1142	1	3030	
159	8210	A	1143	1	4170	MNSLEQNPRSKWELLHRGTMELWPTM WADEEEQGLKAVLALSAKKFVPGARSK TGLTDCMGVGGGLLLPAFPHIPGKRDSH NPLWNITPENQSPTPTVAMERSSSPATEQ SWMENDFDELREEGFRRSNYSELQEEIK TKGKEVKNFEKNLDECITRITNTEKCLKE VMQLKAKARELREECRSLRSRWNQLEE RVSVMEDEMNEMKREGKFREKRIKRNE QSLQEIWDYVKRPNLRLIGVPESDGENA TRLENT
160	8211	A	1144	1	3921	
161	8212	A	1145	1	2884	MVKGSIQQEELTILNIHAPNTGAPRFIKQ VLSDLQRDLDSHTLIMGDFNTPLSTLDRS MRQKVNKDTQELNSALHQADLIDIYRTL HPKSTEYTFFSLPHHTYSKIDHIVGSKAL LSKCKRTQIITNYLSDHSAIKLELRIKTLT QSRSTTWKLNNLLLNDYWVHNEMKAEI KMFFETNENKDTTYQNLWDAFKAVCRG KFIALNAHKRKQERSKIDTLTSQLKELEK QEQTHSKASRRQEITKIRAELKETETQ
162	8213	A	1146	1454	3917	
163	8214	A	1147	11537	15574	
164	8215	A	1148	115	450	
165	8216	A	1149	278	885	
166	8217	A	115	116	565	EPTGTASRAATMPNFSGNWKIIRSENFQE LLKVLGVNVMLRKIAVA\AASKPAVEIK QEGDTFYIKTSTTVRTT\EINFKVGEEFEE QTVDGRPCKSLVKWESENKMVCEQKLL KGEGPKTSWTRELTNDGELILTMTADDV VCTRVYVRE
167	8218	A	1150	2	378	
168	8219	A	1151	172	464	ASHRVGLLQPFLNLWPSGCSTVLAKMK SVLVATEGAEVLFYWTDQEFEESLRLKF GQSENEEEEVGLLML*AR*PHPHTPPVLS GLNEGKKKSNFIT
169	8220	A	1152	164	528	
170	8221	A	1153	1	1122	
171	8222	A	1154	1	558	
172	8223	A	1155	1	495	
173	8224	A	1156	51	579	LRSSSPATEQSWTENDFDKLREEGFR*SN YSELQEEIQTKGKEVENFEKNLEECITRIT NTEKCLKDLMELKAKARELHEECRSLRS RCDQLEERVSVMEDEMNEMKREGKFRE KRIKRNEQSLQEIWDYVKRPNLHLIGVPE SDGENGTKLENTLQDIIQENFPNLARQA NIQIQ
174	8225	A	1157	286	456	FCHLSSTSWGGADGTCREGGPLGGFMG PSHQ*ESSPVPEAASSFRTFKSSAVSQSPL

175	8226	A	1158	1	1758	MDD1PQEARQYRHNQAYAYSIQGDGAEDDDERIVRFHTRVTVDSDTLASDAARLTCRHGLGNQDRSSSPAMEQSWTENDFDELTEVGFRRSV1TNFSELKEDVRTHRKEDHSA1KLELR1KKLIQNLTTTWKLNNLLLNDYRVNNEMKAE1KMFFETNENKDTTYQNLCDTFKAVCRGKF1ALNAHKRKQERSK1DTLTSQLKELEKQEQTHSKACRRQEITK1QAELKE1ETQKTLQK1NESRSWFFEKINKIDRPLARLIKKKREKNQ1DAIKNDKGY1TTNPTEIQTT1REYYKHLYANKLENLEEMDKFLDTYTLPRLNQEEVESLNRPITGFE1EAIINSLPTEKRPVPDGFTAKFYHSSADCTRSMAPAPASGEALRLLPLMGEGEGELTCRDHIAREEAQECSSSPATEQSWMENDFEELGEEGFRRSV1TNFSELKEDVQTHFKEAKNLEKRLDEWLTRINSVEKTLNDLM*LKTVA*ELRDTYTSFNSRFDQVEERVSV1EDQMNEMEREEKFREKRV*RNEQS/LQE1WNYVKRPNLHLIGVSEIDRENGTKLENTLQD1FQENFTYLARQAN1QIQ
176	8227	A	1159	138	324	
177	8228	A	116	343	528	
178	8229	A	1160	1	525	
179	8230	A	1161	319	1035	EWSSVRRSLVEKRALRRPHPQCLCFRMKTIL\SNQTCRPFPE\NVDITLKGRTVIVKGP/REGTLRRDFNH1\NVELSLLWKEKKRGFRVDK\WWGNRKEL\ATGRD*FVSHVQNM1KGCYTGASGYKMKVLWYAHFP1QRLLFQGELGPSLLKSRNFLGGWKNTSRRVSG*GPGCLLVSVSQGPRKDE1NPLKG\NDIELVSKFQRAL1QQ\ATTVKNKG\1RKFFGWVSMSLEKGTVQPGLIE
180	8231	A	1162	232	338	
181	8232	A	1163	474	647	
182	8233	A	1164	1	413	
183	8234	A	1165	2	2545	
184	8235	A	1166	1364	1618	SQHSGRPRQADHLRSGVRDQPGQHGE1LSLLK1QKLAGRAGSRL*SQLLERLRLYHRTPA*VTE*DMASKNKKKPHR1QARKYF
185	8236	A	1167	3	342	LTQELPGAEAHACNPSTLGGQGGQIMRSGARDQPGQHSGTPSLLK1QK\LAGRGGTHL*SQLLRRLRQENRLNLGSGGCSELRLRHCTPAWVTDSVSKKNELEKESYL1FSSLT
186	8237	A	1168	2	232	WAGRGGSRL*SQHFGRPRRADHERWKNTWELRQLNLGQAPCSRNGMRRYGERRHHPDEPGQPSVEGFLRVLSMC1C
187	8238	A	1169	1294	1624	GQLYEKLGRRGPGAVAHACNPSTLGGRGGW1TRSGDRDHPG*HGETPSLLK1QKK\LAGRGGGHL*SQLLGRLRQENGVNPGA/RGCSELRSCYCTPAWGTERDSVSKKKKK
188	8239	A	117	296	629	FKLTSSRNVPPTGPGAVAHACNPQHFGRPRQVDHLRSGV*DQPGQHGETPSLLK\IQKLAGHGGVHL*S*LLRRLRQENRLNLGGGGCSEPRSHHCTPAWTTG*DSASKKKK
189	8240	A	1170	427	730	
190	8241	A	1171	6497	6788	SQRFGRPGQANCLSSGV*DQPGQYGETLSLLKIQKLGGCGGTCL*S*LLGWLRQENHLNLGDGGCSEPRMCHCTPPWTTEGGSA*KLKKKKKKRKYL
191	8242	A	1172	173	395	
192	8243	A	1173	239	404	

193	8244	A	1174	126	915	SACVSCNPAALLLALRSAGPPSFLPPHPARGSAGCVTLSHPTHQPAGQHHGWTVKLE\FPSLPQCK\EDAE\EWTYPMRREMQ\EILPG\LFLGPYSSAM\KKQDPSLLAVSSHGQENEFLPLLTRVQSCHGGFYPHDLNLKLIIFQRLHHHILGLPVLQKHGITHIICIRQNIEANFIKPNFQQLFSAAFVIAYIMETFGMKYRDAFAYVQERRFCINPNAGFVHQLQEYEAIYLAKLTIQMMSPL/RDRKVIICSFWYHRQFEENT
194	8245	A	1175	1	924	
195	8246	A	1176	441	707	
196	8247	A	1177	109	437	NQRRKWRRSRTQLQTLQEALKAEIQGHQKLAAQMKQDPQNADL*KQLYELQAKITALSEKQKRVVEQLRKNLIVKQEQPDKFQIQPLPQSDNKLRTAQQQPLQQLQQQQ
197	8248	A	1178	343	670	
198	8249	C	1179	130	390	MAEQSLISGGPKPKSVNSLRWINLXXXXXXXXXXXXXXXSXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXSWVDK*
199	8250	A	118	74	396	GQILALMPKGGGQGGILTYPNPPLPG*NNFPGLTPPRTGINGLGPPGRVNFGIFKKKGGFPPGARGV*NPGPRGASSPGFPKGRG*SPPP/QGPFKPLKRFPDLPIFPR
200	8251	A	1180	238	435	
201	8252	A	1181	615	945	
202	8253	A	1182	232	564	
203	8254	A	1183	3	487	LPNMAQSINITELNLPQLE\MLKNQLDQEVEFLSTSIAQLKVVQTKYVEAKDCLNVLNKSNEGKELLVPTDGVLCMSPGKLH\DVEHVLID\VGTGYYVKKTA\EDAKDFFKRKI\DF\LTKQMEKIQPALQEKHAMKQAVM\EMMS\QKIQQLTA\LGEAQATAKA
204	8255	A	1184	187	423	
205	8256	A	1185	539	871	
206	8257	A	1186	158	1330	SVDLVIHPLWPPEVLGLQQQPTQFINPETPGYVGFANLPNQVHRKSVKKGFEFTLMVVGESGLGKS/TLS*NSLFLTDLYPERVIPGAAV*FFSRKN*KELVQIEAST\VEILRARGSSLRLASG*DTPG\YG*PLFN\CRDCF*GQFISYYLMRQF*GGYL\HDESG\LNRRHIIDNRVHCCFHFISPF\GHGLQPLDVAFMKAIHNKVNIVPVIAKADTLTLKERERLKKRILDEIEEHNIKIYHLPDAESDEDEDFKEQTRLLKASIPFSVVGSNQLIEAKGKKVRGRLYPWGVVEVENPEHNDFLKLRTMLITHMQDLQEVTQDLHYENFRSERLKRGGRKVENEDMNKDQILLEKEAELRRMQEMIARMQAQMQMQMQGGDGDGGALGHHV
207	8258	A	1187	405	632	
208	8259	A	1188	111	375	
209	8260	A	1189	428	574	
210	8261	A	119	454	777	ADPMSPSSKSPNMEAVLWIPDTNIVL*SLKVYPSS*TIKSWLGT/CGSRL*CQHFGRPRRVDHEVKRLRPS*PTWRTPSLL/RTTKISRAWWHTSVVPATREAEAGESLE
211	8262	C	1190	216	458	MNRDRTSRNRCVCDVFRNAVKGQTVLGRQLFIGRVRVPVRPGEGFLPWGFLPVSPWCPSWGLSTHALWWAEAVPGRALVH*

212	8263	A	1191	1	594	RTRGRTRGLLPSGAFEPEAAGSATAPRG CKNPGAKGGLLAAMAGRQDIFHAIVKA DERFHGEGYREGYEKGSILGVKEGRQHG TLHGAKIGTEIGRYQRFAFAWKCLLH\IA PLRRTA*T*RS*HAWIGRIQIFPYDDPTYD KLHEDLDKIRGKFKQVRALCVSSC*EHLI APFPGGAAHSRGRCGNGLGLRAPRNCP
213	8264	A	1192	482	788	
214	8265	A	1193	572	676	
215	8266	A	1194	1	394	KGGSMHMYAKNFYGGNGIVGAQGQIFE AYNMAALWKLPCIFICENNRYGMGTSV ERAAPST\DYYKRGDFIPGLRVDGMDILC VREATRFAAAYCRSGKGPILMEL\QTYR YHGHSMSDPGVSYRTREEIQE
216	8267	A	1195	641	722	
217	8268	A	1196	354	1145	KQISCINRKLFVVSVTCVMVRKLAVWA WRPASTPQTISSQPTGLTALLSPGAFPSE KFSQSLQDEKEVVLKGKEDRCTCMPRTS TGAMASWERRCPWAAGIALACKYNGK DEVCLTLYGDGAANQGQIFEAYNMAAL WKLPCIFICENNRYGMGTSVERAAASTD YYKRGDFIPG\LRVDGMDILCVREATY\I GRAYCRSGKGPILMELQTYRYHGHSMS DPGVSYRTREEIQEVR\SKSDPIMLLKDR MVNSNLASVEELKGI
218	8269	A	1197	2	506	
219	8270	A	1198	1	1455	
220	8271	A	1199	509	839	
221	8272	A	12	105	702	AGSSVSLGFCPAAAAHKPRGGALRLPVF RRRAQQGPDYALAGVARQPAGTCRRRC NRSHCRAEDPQWPTPAAAPAAHSPHMS LGESGLGKLILINSLFLTDLYSPEYPGPSQ RIKKPVQVYILVFLIDDKLE*Y*YTQSTC CNFHYAS\QSWQPAINYIDSKFEDYLNAE SRVNRCQMPGNRVQGCLYFIAPSGHGPL HN
222	8273	A	120	133	359	RHCSSGMEIPPTNYPASRADLVAQNYIN YQHGTPHRVFEVHNAYRVIMQD\MSG* GHLVSPSSRFFLHSFATSLFE
223	8274	B	1200	109	267	MEETPCRELEEEEEWGSGSEDASKKDGA VESISVPDMVDKNLTCPEEEDTVKV*
224	8275	A	1201	856	1030	VPNLQVGDEKQDSPNGEHWHGQE\DST AEPAEVKAMMSVAVV*KNLTTPPPLLG RSSV
225	8276	A	1202	67	264	
226	8277	A	1203	3	1251	
227	8278	A	1204	1403	3362	
228	8279	A	1205	388	1711	ACALGMAPQRKRRKQLSMKTGSYSQRS SFQRRKRPQGQGRSRNSAPSGATLSLGA LAWHLEWLSVIQLWHYLFIGTLNSLLTN MAGGDMARVSTYTNAFAFTQFGVLSAP WNGLLMDRLKQKYQKEARKTGSFNIRG PHSLYFPNHHLPHATYRDKAKMKLPLLL ALLFGAVSAL\HLRSETSTFETPLG\AKTL PEDEETPEQEM\EETPCR\ELGGRGREWG LWEVEDASQERWGLFESILQCPDMGGT KTFTCS*GKEGHQLKVGWGIPGGCPRPA RYLPG*ESLSRRFSSKLWFYFARSC\YRG QTWVFHSTTFQY*LSESKCSV\SALN\QG QVWIG\GRI\TGSGR\CRRFQWVDGSRW\ NF\AYWG\AHQPW\SRGGHCVALC\TRG\ GYWA\RAH\CLQKNFPFICFPLSWSQPAV QVVPSPGQLPPLLCLPSLPPPPCNNNGFY
229	8280	A	1206	97	441	
230	8281	A	1207	19	432	
231	8282	A	1208	165	257	

232	8283	A	1209	80	1239	GAVVGGGGRRRRRRITYKCLPKLDPKPKFQEGERVLCFHGPLLYEAKCVKVAIKDKQVKYFIHYRGWNKNWDEWVPESRVLKY\VDTNLQKQRELQKANQEQYAEGKMR\GAAPGKKTSGLQQKNVEVKTKKNKQKTP\GN\GDGG\STSETP\QPPRKKRARVD\PTV\ENEETFM\NRVEVKVKIPEELKPWLVDD\WD\LITR\QKQLFYLPAKKNVDSILEDYANYKKS/RVGNTDNKEYA/VLNEVVAGD*KNTFNV\MLG\TQLLYKFERPQYAEILADHPDAPMSPGVWSAQHLLEIIWYRIGAMLAYTPLDE\K\SLALLLNYLHDFLKYLAKNSATLFSASDYE\VAPPEYHRKAVWKSTLTHLCLDLRKHIFVLSLSPWYKPMCFEDVSV
233	8284	A	121	3	1671	SSGARWRFRAGSMGLFCQRKHSS/SHPVLQKPSVFGNDSDDDDETSVSESLQREAAKKQAMKQTKLEIQKALAEDATVYEYDSIYDEMQKKKEENNPKLLLGKDRKPKYIHNLLKAVEIRKKEQEKRMEKKIQREREMEKGEFDDKEAFVTSAYKKKLQERAEEEEREKRAAALEACLDVTKQKDLSGFYRHLLNQAVGEEEVPKCSFREARSGIKEEKSRGFSNEVSSKKQNTTREMHSFKLM*K*RENPDADSYFDAKSSPDD\K*KKLELTAEGKRS*RPLRMTSSTTGVKTTLGHLVKKEGTVPGTTRKDHERREDMRKGKISTSRSNPETKRTITLTVITGKKGILIGTERPVIEIPIGRGMNRKINQGRGTKEKEVTEYGKGRKIGRNIPKENKKEIDNKMIRTDPVRKERRKRKAKQRKRAYESKGGKVLKLLINTEIEKNER*VFS/ASERNQDQKGKQPKFQGQRINFLTNLDFIQNGETWQRTKERNQEKPSNSESSLGAKHRLTEEGQEKGKEQERPPEAVSKFAKRNNEETVMSARDRYLARQMASG
234	8285	A	1210	31	1029	WWNSEVPHGPFRMKAAVLTL/APVLFSDG*ARRRHFWQGG*SPPRAAWDRV\K\DLATRVPWTVLKEQRTETYVSQFEGLRLGENS*TLKLL\DNW\DSVDLPPFS\KLREHSFGPC*PRDFLGINLGKRETRGALRQGRLRQRIFGRRLKGPRLQP*LGDDFPRKKLARKEIGALTRQKGWSRLRARTSKKGARPESLHELARRSLSPLGEAVSRPRARPMWDALRTHLAPYSDEM\SQRLGAR\LGALRENGGARMGQYHA\QATE\HLSTLSEKAKPALED\LRQGLLPVLESFKVSFLSALEEYTKKLNTQLRRPPPPPYPVLRINVSKVGKKKKKK
235	8286	A	1211	3	450	QTQREPTMVLSPADKTNVKAAWGKVGAHAGEYGAEALER\MFLSFPTTKTYFPHFDLSHGSAQVKGHGKKVADALTNAVAHVDDMPNALSALSDLHAHKLRVDPVNFKLLSHCLLVTLAAHLPAEFTPAVHASLDKFLASVSTVLTSKYR
236	8287	A	1212	9	675	NSARATDSERTHHGARLLPDKTNVKA\AWGKVGAHAGEYGAEALERMFLSFPT\TKTYFPHFDL\SHG\SAQG*RAHGK\KVA\DALT\NAVA\HVD\DMPQTALSALSGPATAHKL\RVDPVQLSSS*SHLPCWWTLGRPTSPSEFNPWRLHAFPGTKFPGLLVEAPLLEPSKLPLKLGSLRVGHAFFAPLGLPPRALLPFPGTRNPVGLLNKILNWGGKKKKKKKIF
237	8288	A	1213	1	645	KIFLSDCLACDSCMTAEKGVQLSQQNAKDFFRVLN/LNKKCDTSKHKVLVVSVCPQSLPYFAAKFNLSVTDASRRLCGFLKSLGVHYVFDTTIAADFS/H/RWRMLKWQRPSPDSRRTCG*GPAAADGRHLR*HPCAASGVQCKRAGAVPGVAGGDQLPQGPRGAAYHVPEPGAWHTQPGHQVVKSGQGLPAALGAPAKSLSVEGGAALSGVLKTLKKT

						LGARAKSLSVEGGAALSGVLKTLKKT
238	8289	A	1214	193	564	
239	8290	A	1215	211	1795	TPLGRRRRRKTHDKRKPGQGPGPPGAECSKKTK\ADDQENVSADAPSPAQENGEKGEFHKLADAKIFLSDCLACDSCMTAEEGVQLSQQNAKDFFRVLNLNKKCDTSKHKVLVVSVCPQSLPYFCWLNFNLSVTD\ASRRLCGFLKSLG\VHYVFDTTIAADFSIL\ESQKEFVRRY\RQHSEGGNAPCPMLTSACPGL/WVRYAGAGCWGRPITG/HTFLAPPKSPQQVMGSLVKDYF\ARQQNL\SPEKIFPRSLVAP\C\YDKKL\EALQGKPFPLALHG\SRGRLTCV\LTSGEICFKLM\EQGDLSVRDAAVDTLFGDLKKDKVTRHDGASSNGHLAHIFRHAA\KELFN/ERDVEEVTYRTLRNQRFPQKVTLEEEPKRWV*TFVLEPYAFRNIPET*SLKPLKKGKVPPF\HFVEGSSPCA\GGCL\NGKRPKPKIQDGHGDKAPAAGRMEGIY/SLDIPVRRPES\SAHVQE\LYQ\EWLEGI\NSPKARKVL\HTTYQSQ\ERGTHSLGHSSWLKFRPGPSSCSWGQSQEPLSRGRGLP
240	8291	A	122	170	339	IMKLITILFL*CRLLLSLTQESQSAEIDLLDNDLFLAEEA\GLYRYIMQIQTNPRI
241	8292	A	1222	1	456	RPRRPQREPTMVLSPADKTNVKAAWGKVGAHAGEYGAEALE/RMFL/SFPTTKTYFPHFDLSHGSSQVKGHGKKVADALTNAVGHVDDMPNALSALSDLHAHKLRVDPVNFKLLSHCLLVTLAAHLPAEFTPAVHAFLDKFLASVSTVLTSKYR
242	8293	A	1223	2	435	QTQREPTMVLSPADKTNVKAAWGKVGAH/AGEYGAEALERMFLSFPTTKTYFPHFDLSHGSAQVKGHGKKVADALTNAV/EHVDDMPNALSALSDLHAHKLRVDPVNFQAPKATGLLVDPGPAHFPGRVSPLRLQGFLGTKFLGFC
243	8294	A	1224	9	390	NSARATDSERTHHGARLLPDKTNVKA\AWGKVGAHAGEYGAEALERMFLSFPTTK\TYFPHFDL\SHG\SAQ\VKGPTAKKVAERADQTPWRNVDDMPKRRCPP*SDLH\AHKL\RVDPVQLSSS*SHLPCW
244	8295	A	1225	3	452	
245	8296	A	1226	26	636	NSTDSERTHHGARLLPDKTNVKA\AWGKVGAHAGEYGAEALERMFLSFPT\TKTYFPHFDL\SHG\SAQV\KGHGQ\KVADALTNAVAHV\DDMP\NALSALSDLHAHKL\RVGPGSTFKLLKPLALLG*TLGRPPSPAEFQPLGGCKASLGTKFLGFLVEAPLLEPSKLPLKLGSLRLAMLSLPLWAFPPAPPPLSCTRTPVVFEIKS
246	8297	A	1227	17	233	AFGTRELQCCVFLASMLGVPPIPTVQGFQWTLRGTDVETSPFGAPRATSHGVGQMKSCQIPQPLKIRMVKQNNIIPGETQILLRFTGWESKVNAKKQPPVGIKCEPMDQGNEQTGGHETDGHRIGSVVVSAATQECLI*NTTRNVWTQ*TKSNLTRCGPNEELPDPTALEDKDGQTK
247	8298	A	1228	1	433	
248	8299	C	1229	312	443	MHKRNFHRAGRSQAVQDNWKELNNIYPVSPARLQALLPPAAPC*

249	8300	A	123	23	307	RQTRWCPVVRLSHYRTLGGCCHLRRGRGVA*VRGPQSGTISSVENTPPWRRVSCFPAPNITCKDSSGNETHFTGNEVGFFKPISCRNVNGYSYK
250	8301	A	1230	1	94	
251	8302	A	1231	2	122	DLLCPQMG*GWKLTALSLQCSLQDGIERSRAKASQCCLSI
252	8303	A	1232	3	53	
253	8304	A	1233	1	2679	SAVGSDHIFHNIPDSTSSATNVSMVVSAGPWSSEKAEMNILEINEKLRPQLAENKQQFRNLKERCFLTQLAGFLANRQKKYKYEECKDLIKFMLRNERQFKEEKLAEQLKQAEELRQYKVLVHSQERELTQLREKLREGRDASRSLNEHLQALLTPDEPDKSQGQDLQEQLAEGCRLAQQLVQKLSPENDEDEDEDVQVEEDEKVLESSAPREVQKAEESKVPEDSLEECAITCSNSHGPCDSNQPHKNIKITFEEDKVNSTVVVDRKSSHDECQDALNILPVPGPTSSATNVSMVVSAGPLSSEKAEMNILEINEKLRPQLAEKKQQFRSLKEKCFVTQLAGFLAKQQNKYKYEECKDLIKSMLRNELQFKEEKLAEQLKQAEELRQYKVLVHSQERELTQLREKLREGRDASRSLNEHLQALLTPDEPDKSQGQDLQEQLAEGCRLAQHLVQKLSPENDEDEDEDVQVEEDEKVLESSSPREMQKAEESKVPEDSLEECAITCSNSHGPCDSNQPHKNIKITFEEDKVNSSLVVDRESSHDECQDALNILPVPGPTSSATNVSMVVSAGPLSSEKAEMNILEINEKLRPQLAEKKQQFRSLKEKCFVTQVACFLAKQQNKYKYEECKDLIKSMLRNELQFKEEKLAEQLKQAEELRQYKVLVHSQERELTQLREKLREGRDASRSLNEHLQALLTPDEPDKSQGQDLQEQLAEGCRLAQHLVQKLSPENDNDDDEDVQVEVAEKVQKSSSPREMQKAEEKEVPEDSLEECAITCSNSHGPYDSNQPHRKTKITFEEDKVDSTLIGSSSHVEWEDAVHIIPENESDDEEEEEKGPVSPRNLQESEEEEVPQESWDEGYSTLSIPPER\HRWDQVKKEDQEATGPRLSRELLA
254	8305	B	1234	33	2996	MLRNERQFKEEKLAEQLKQAEELRQYKVLVHAQERELTQLREKLREGRDASRSLNEHLQALLTPDEPDKSQGQDLQEQLAEGCRLAQHLVQKLSPENDNDDDEDVQVEVAEKVQKSSAPREMQKAEEKEVPEDSLEECAITCSNSHGPYDSNQPHRKTKITFEEDKVDSTLIGSSSHVEWEDAVHIIPENESDDEEEEEKGPVSPRNLQESEEEEVPQESWDEGYSTLSIPPEMLASYKSYSSTFHSLEEQQVCM
255	8306	B	1235	16	1041	MVKQNNIIPGETQILVRFTGWESKVNAKKQPPVGIKCEPMDQEYEECKDLIKSMLRNERQFKEEKLAEQLKQAEELSMVVSAGPWSSEKAEMNILEINEKLRPQLAENKQQFGNLKERCFVTQLAGFLANQQKKYNYEECKDLIKFMLRNERQFKEEKLAEQLKQAEELRQYKVLVHSQERELTQLREKLREGRDASRSLNEHLQALLTLDEPDKSQGQDLQEQLAEGCRLAQHLVQKLSPENDEDEDEDVQVEEAEKVQKSSAPREVQKTEESKVPEDSLEECAITCSNSHGPCDSNQPHKNIKITFEEDEVNSTLVVDRESSHDECQDALNILPACMTE*

256	8307	A	1236	1	2219	MSQSVQDNLKELNNIYPDHSSSPAMEQS RMENDFDELTEVGFRKLVITNFSELKED VRTHRKEAKNLEKRLDEWPTRMNSVEK TLNDLMELKTMARELRDACTSFSSQFDQ VQETPLKIRMVKQNNIISAESQILVRFTS WESNVNAKKQLPVGIKCEPMDQECIPGS RACTLLVRFSNGGPPMDPGSERKDLLQL GGELARTSRAVQEAGLGLSTGLWLAESR AKAALEKQALLQAQLEEQLRDKKDLAQ QQMQSDLDKADLSARVTELGLAVKRLQ KQNPEKDQVNTDLTEKLEALVQMLPLES QLPIPTSGTLTPPGYSLVWSPLCVGPGLG SRSGSPPIDCVTWGKTDSTMQAHEDAQR EVQRLRSAKELLRRLSGMLMEVEEPEVL QDSLDRCYSTPSMYFELPDSFQHYRSVF YSFEEQHISFALDVD/E*VSYFDGNKSPP GLPDGSHIPTPRTAGQARLLLHARRRIPQ ERTTTPKVSQLASWVSLG/RQYLHPAGS LRWL*TTLPPTSSSMFPLCPQ/YPSEDSRE AGIKKDQEEEEDQGPPCPRLSRELLEAVE PEVLQDSLDRCYSTPSSCLEQPDSCLPYG SSFYALEEKHVGFSLDVGGYLELTDSCQ PYRSAFYILEQQRVGWALDMDEIEKYQE VEEDQDPSCPRLSRELLDEKEPEVLQDSL DRCYSTPSGYLELPDLGQPYRSAVYSLE EQYLGLALDVD/E*VPYYEDEETEAQRSE DTGAGSHSW
257	8308	A	1237	3	1270	
258	8309	C	1238	160	267	MGPLTLSSSSLHTETFLCPILTQGHQSCQ CENRRL*
259	8310	A	1239	1	1233	
260	8311	C	124	35	91	MSPPQNKGPFPKSPGWF**
261	8312	A	1240	401	2582	
262	8313	A	1241	946	2562	FPLAYSLLFPP/CSRLSRELLEVVEPEVLQ DSLDRCYSTPSSCLEQPDSCQPYGSSFYA LEEKHVGFSLDVGEIEKKGKGKKRRGRR STKKRRRRGRKEGEEDQNPPCPRLSREL LDEKGPEVLQDSLDRCYSTPSGYLELTD SCQPYRSAFYILEQQRVGWALDMDEIEK YQEVEEDQDPSCPR*L*AITDA*FCVDTW RCQVQGKQECVQFHVFNEG*ITPTDIAV GFHCSRCLGFHFFLPLSFTHLL*VDHTSK AVWQLHGILSKFMENY*AHSFHDHCSLC VPRALTQSVL*PLHQCVTRPIR*AHFLLS LSLPLPVFLFHSFLPGPGLSQHKGNNSLP H*WICPFSF*TVPYVSHEI*LGLCGF*FPL AYSLLFPT/CSRLSRELLDEKEPEVLQDSL DRCYSTPSGYLELPDLGQPYSSAVYSLEE QYLGLALDVDRIKKDQEEEEDQGPPCPR LSRELLEVVEPEVLQDSLDRCYSTPSSCL EQPDSCQPYGSSFYALEEKHVGFSLDVG EIEKKGKGKKRRGRRSKKKKKGRP
263	8314	A	1242	442	5178	HQELPDPTGPCGGRLLSLTIHGVTIRYHA LLWARGPIMSKSQVLGEWEPVQGGKSS ENDKWTMSDPGAEAPTCSRAASGVDKE QQGRWQGLWNSHIKPLKIRMVKQNNIIP GETQILLRFTGWESKVNAKKQLPVGIKC EPMDQENEQTGGHETDGHRIVSVLIHFP LISILSYATWGLSLLECIPGSPVCTLLVRF SNVGTRWSLEVRGSPCGFGSNKVCGVM TPEIKMVCVCEGKAGKAVGSGGVEGTK EVST

264	8315	A	1243	1	3242	MDKPRPGKTTFVIMVSPLPAPYTSPFTHMVTCPAHPRAFLALTHSWDPQVRPAVLNPLPRHGSSFVVKQPVAKQQPLRCLIYIEVALSVMSPTAPSSSRSPWKRPGLRPGFEQPGGSREAERLVGSRDGSSRSLHSLHPVREPVPSLLSRIRGAAELPLPSSDPAFGTGAPPGQGSWQYKVLVHAQERELTQLREKLREGRDASRSLNEHLQALLTPDEPDKSQGQDLQEQLAEGCRLAQHLVQKLSPENDNDDD
265	8316	A	1244	148	197	DPLGFL*QKRNQQEDD
266	8317	A	1245	1333	2383	RMKKEHVLHCQFSAWYPFFRGVTIKSVILPLPQNVKDYLLDDGTLVVSGRDDPPTHSQPDSDDEAEEIQWSDDENT\ATLT\APEFP*SLPLKVQGSYQIPLGGQVSFPKV*FGS\APRD\AYWIAMNSSLKCKTLSDIFLLFKSSDFITRDFTQPFIHCTDDSPDP\CIEYELVLEKWCEMIPGG\EFRCFVKENKLIGISQRDYTQYYDHISKQK\EEIRRCIQDFFK\KHIPVQIL*MKDLVFDIYR\DSRG\KVWLIDF\NPFGEVTDSLLFTWEELI\SENNFKRRFLVKVDAQEQDSPSFSVAQTSEVTVQPQPLICSYRL\PKDFVDLS\TGEDAHKLIDFLKLKRNQPEGR
267	8318	A	1248	66	703	RRRRLPSVAIMIILPGPSSSHDEMF\SDIYK\IRGDRGRGLCLEGGRGRWVSRTE\GTID\DSLIGG\NA\SAESPRGAKGTERHK*STGV\DIVMNHHLPGNKFSQKEASKKVHQRITMKSI\KGKP*KNRRPRKSKTFL*QGAAEQIKHILANFKKLQF/YFIGENMNPRWAWVLLLDY*RDGVPP\YMIFFK\DG\LEMEKMLTNVAIILDLSPCHP
268	8319	A	1249	1	521	MKNRSRNKGNVEWQAEGIRSKRSVGKQRPSKAKIPSGDKNGVSLTHNEVINNDNPLESNDEKEGQEATCSRPQIVP/EFQQ**LFRPE*WRRASGNLQLIPKKRVSA*GTRGSPSKKGERVRRDAQQTATW*TRSPASGCFQICEGNKQDEACDVRGLQHCERHSLAGPREYMP
269	8320	A	125	50	230	NLKGPLRRPVSGIIIHVISLPLYQKCSKNEKKIPWRQMEM/C*NVPSANNPPLGLLKNIVF
270	8321	A	1250	3	168	
271	8322	A	1251	3	249	
272	8323	A	1252	23	2669	
273	8324	A	1253	97	1609	GGKMAGGGGDLSTRRLNECISPVANEMNHLPAHSHDLQRMFTEDQGVDDRLLYDIVFKHFQR\NKVEISNAIKKTFPFLEGLRDRDLITNKMFEDSQDSCRNLVPVQRVVYN\VLSELEKTFNLPVLEALFSDVNMQEYPDFKFHIYKGFE\NVI\HDKLPSPRKVEEEEKGRRGLGLPTKSLNKGTGENSFRKPDFGPPSGFPHPPCLGTTPPE/NMGLSEHPCETEQINAKRKDTTSDKDDSLGSQQTNEQCAQKAEPTESCEQIA\VQVN\MGDAGREMPCP\LPCDE\ESPRGKSLHNHWNPKFNSLVLCELVDIKKEKPFSNSKVE\CQAQARTHHNQASDIIVISSEDSEGSTDVDEPLEVFISAPRSEPVINNDNPL\ESNDEKEG\QEATCSRPQIVPE\PLIFRKLFT\FRESFRKRVIG/QKTHDFSESQ*GGGAPQEASSGGTEEARHGEKAPIDF*EVHLTWEEYPSR\KETFPAVSDFSDPE*MGERAFQETC\SSS\LRRGLG
274	8325	A	1254	3	274	FFASLLESPVSPRLAMDPNCSCAAGVSCTCAGSCKCKECKCTSCKKSECEAISMVWGCG*GCCSCCP/AAASKCAQGCVCKGASEKCSCCD
275	8326	A	1255	788	1173	

276	8327	A	1256	80	231	IRPLPPRFKTESRSLPGPCLQPGTFLWSRN RRVLGFPSMNGEDMGLLFLCSEWERSSE GWLCTEKGEVDTQLNPTAVPSCISLTAH CVFLFLVGGSCTCAGSCKCKE\CKCTSC KKSECG/CH/PPGIWGCG*GAWFSQHEW RGHGASLPLL
277	8328	C	1257	81	476	
278	8329	A	1258	3	452	
279	8330	A	1259	9	486	NSARATDSERTHHGACLLPDKTNVKA\A WGKVGAHAGEYGAEALERMFLSFPTTK\ TYFPHFDL\SHG\SAQG*RAHGK\KVA\DA LTKRRGATWDDM/PQTALSALSDLH\AH KL\RVGPGSTFKLL\SQLPCLGEPWAAHL PA\EFQPLAVARLPWNKVSWGFC
280	8331	A	126	814	1292	GISPFYIFGQDMGLEKNPTSFPSKMCFHC PLESLPSYVGCWKTGNMSCVVCTVNWF LRSVIYFWIFTNILSHFEVLALKRLLAPG GGGNMPPRVL*\CCRRTTGHQRVWPSRP PEQTDQTARRPPSWRPTL/CSPLPLPPPPR SGREKGNRARFLKGPRIG
281	8332	A	1260	3	497	PTLLVPTDSERTHPWLLSPADK\TNVKA\ AWG\KVGAHAGEYGAEALERMFLSFPTT KTYFPHF\DLSHG\SAQV*GPRARKVADA L\TNAVAQRGTDIAQRACPPLSDLH\AHK L\RVGPGSTFKLLKATC/HCLGEPWAAHL P\AEFQPLAVARLPWGQSFLGFLLKQRC
282	8333	A	1261	1	1077	MLSGVGGFVLGLLFLGAGLFIYFRNQKA EESFVSALSIDLSGGGNMALLSMVCLKF PGG\SCMAALTVTLMVLSSPLALAG\DTR \PPVRLRKTEDEPLGCVLSGLRVGPDSVF PGGRFCNRIVLVPPARFLEQVKHECHFF NGTERVRFLDRYFYHQEEYVRFDSDVG EYRAVTELGRPDAEYWNSQKDLLEQKR AAVDTYCRHNYGVGESFTVQRRVYPEV TVYPAKTQPLQHHNLLVCSVNGFYPGSI EVRWFRNGQEEKTGVVSTGLIQNGDWT FQTLVMLETVPRSGEVYTCQVEHPSLTS PLTVEWRARSESAQSKMLSGVGGFVLG LLFLGAGLFIYFRNQKGHSGLQPTGFLS
283	8334	A	1262	3	825	LFSSMVCLKLPGGSSLAALTVTLMVLSS RLAFAGDTRPRFLELRKSECHFFNGTER VRYLDRYFHNQEEFLRFDSDVGEYRAV TELGRPVAESWNSQKDLLEQKR\AAVDN YCRHNYGVGESFTVQRRVHPQVTVYPA KTQPLQHHNLLVCSVSGFYPGSIEVRWF RNGQEEKAGVVST\GLIHNGDWTF\HTL VMLETVPR\SEEVYTC\QVEAPRA*QAPL TVE\WRARSESAQSKMLSGVGGFVLGLL FLGAGLFIYFRNQKGHSGLQPTGFLS
284	8335	A	1263	11	885	DLPASLAPGPVLFSSMVCLKLPGGSCMT ALTVTLMV\LSSPLALAGDTRPRFLWQP KRECHFFNGTERVRFLDRYFYNQEESVR FDSDVGEYRAVTELGRPDAEYWNSQKD FLEDRR\AAVDTYCRHNYGVGESFTVQR RVQPKVTVYPSKTQPLQHHNLL/VFCSV SGFYPGSIEVRWFLNGQEEKAGMVSTG\ LI\QNEDGPF\QTLVMLETSFFGVERVNT\ SQVEHPKCARP\LTVE*RARSESAQSKML SEVGG\FVLG\LLLPLGPGLF\IYFRNQKG HSGLQPTGFPELKCR
285	8336	A	1264	25	628	EFHRLRENPPWCLSPADKTNVK/APAWG KVGAHAGEYG\SEALER\MVLFPPPTPKP YFPHF\DLSHG\SAQV*GPRARKVADAL\ TNAVAQRGTDIAQRAVPPLSDLH\AHKL\ RVGPGSTFKLLKATC/HCLGEPWAAHLP\ AEFQPLAVATSSLGTKFPGFLVEAPLLTF QITFKGWKLWLAIVFLPFGLPPSPSSPFL HPYPRGL

286	8337	A	1265	1	625	CKFIRVMAHTRLRLLPLRRKKAHLMEIQVNEGTVAEKLDWARERLEQQVPVNQVFGQDEMIDVIGVTKGKGYKGVTSRWHTKKLPRKTHRGLRKVAC\KDGKLIKNNASTDYDLSDKSINPLGGFVHYGEVTNDFVMLKGCVVGTKKRVLTLRKSLLVQTKRRALEKIDLKFIDTTSKFGHGRFQTMEEKKAFMGPLKKDRIAKEEGA
287	8338	A	1266	1	1251	
288	8339	A	1267	1	903	
289	8340	A	1268	1	1131	
290	8341	A	1269	1	1345	WALPAGFDGVMSHRKFSAPRHGSLGFLPRKRSSRHRGKVKSFPKDDPSKPVHLTAFLGYKAGMTHIVREVDRPGSKVNKKEVVEAVTIVETPPMVFVGIVGYVETPRGLRTFKTVFAEHMSDECKRRFYKNWHKSKKKAFTKYCKKWQDEDGKKQLEKDFSSMKKYCQVIRVIAHTQMRLLPLRQKK\AHLM\EIQV\N\GGTCARESWDWGPREGLKQQVPVKPSVLGRDE\MIELHRG*PKGQKAYKGGHPVVWHTQESCPRKD/HHPRACAKVACIGA\FHPARV\AFSVARAGQ\KGYHPRT\EINKKI\YKIGQG\YLIKGG\KLIKNNASTDYDLSDKSI\NPLGGFVHYGE\VTNDFVMLKG\CVVGTKK\RVLT\LRK\SLLVQTKAAGLWRRITLKF\IDTTSKFGHGRFQTMEEKKAFMGPLKKDRIAKEERSLMPGTDFAVGGVSIKVIFH
291	8342	A	127	191	482	DSSGQVQWLKPIIPVLGNLRQADHLRSGVQDQHVQHGETPSLLKIQKKLARHGGACL*SQLLGRLR/QETH*NSGSRGCSEPRLRHCTLA*ATEGDSI
292	8343	A	1270	3	451	
293	8344	A	1271	9	487	NSARATDSERTHHGARLLPDKTNVKA\AWGKVGAHAGEYGAEALERMFLSFPT\TKTYFPHFDL\SHGFCPRLKGPRQRRWPDALTK\AVA\HVDGHAQTALSGPEATLHGAQSFGVDPVQLSSSLSH\CLLG*PWAAHLPRPSSTPGGWNAFPGTKFPWVSC
294	8345	A	1272	197	821	RLFHSNQTVDHSQKNVDITLKG\RPSNRVRAPKGTLR\RDFNPHQM*NSALLGKEQQRGFRVD\KWWGYQKGNWPTRSGLFGSHVQD\MIKGWLPLGLPVTKMR\SVYAHFPHPTLLSRENGVSLLKSRNFLG\EKYIPQGFRMKTRVLLCQYLKAQKR*N*SLEGND\IGLVS\NFSRLLIPASPTRLKTKGIRK\FLDGIFCLLEKGLFRQA
295	8346	C	1273	22	282	MSEGPSVRSEEAICLYYEELGGGARQTHVRRPLSECSPGDWSHSGVAEGPXCIQFLHITSHGAKEALSTWLGLLTSGPATTAAVLP*
296	8347	A	1274	60	1576	GYLGAPVALG\LW\ALCWSLAIATPLPPTSAHGNVAEGETKPDPDVTERCSDGWSFDATTL\DDNGTMLFFKGEFVW\KSHKWGPGV*SSERWEGFSPSPCGMLAFPFKVHNSVLS*SKGGDKVLGY*PSLKKKGRKGLPKVCSKIDFPGIPHSP\LD\AAVECHRG\ECQAE\GV\LFFQGDRE\WFWDFA\TGNHGRERSW\PAVWGTCSS\ALRWAGPLTYWLSRGNQF\LRFRPCQGEEVPPR\YPRDVRE\YFMPCPGKGH\GTQEWGLGHGNSNHHGP*IYAACSP\HLSLCLALTSDNH\GANFCLSVGTHYWR\LDTS\RDGWHSLAPLLIKWPQGPSAVDAAFSW\EEKLYLVQGHPGYYVFLTKGGY\TLS*GGYPKRLGEREV\GDPSWGFIL\DSVDAAFI\CPGVFLRLHYSWAGRRLWVGW/VP*KSGSPKPTW\TELSFGPHE\KVDGALCMEKSPFGPKFMFPPNGPGL\Y\LIHGPNFTL\YSVVEK\LNA\AKALPQ

						PQNVTQSPGACTH
297	8348	A	1275	1	3431	MLPHERGLETTPRGECIPVRIDTKLFEMLVPQCHKEIALEHKFIYSFLVTLNTKPPGYSHSHPEALLDPEVGDPNGTNAQLIKCFLLPLCPSFPLCPEECMHCSGENYDGKISKTMSGLECQAWDSQSPHAHGYIPSKFPNKNLKKNYCRNPDRELRPWCFTTDPNKRWELCDIPRCTTPPPSSGPTYQCLKGTGENYRGNVAVTVSGHTCQHWSAQTPHTHNRTPENFPCKNLDENYCRNPDGKRAPWCHTTNS
298	8349	A	1276	111	2785	VNNVLGLGHTFWALLASPKMEHKEVVLLLLLFLKSGQGEPLDDYVNTQGASLFSVTKKQLGAGSIEECAAKCEEG\EEFTCRAF\QYHSKEQQCVIMAE\NRKSS\IIIRMRDVVLFLKKKVYSLQSAKT\GNGKNYRGTMSKTKNGIT\CQKW\SSTSP\RRPRFSPATHPSEGL\EENYCRNPDNDPQGPW\CYTTDPEKRYDYCDILECEEECMHCSG\ENY\DGKISK\TMSWDWECQGLGTFQEPHTVHG
299	8350	A	1277	29	454	
300	8351	A	1278	1	1368	
301	8352	A	1279	1	1269	PPTRPPTRPAPGLVPKPSTTCTPACQGLSGAAMKSLVLLLCLAQLWGCHSAPHGPGLIYRQPNCDDPETEEAALVAIDYINQNLPWGYKHTLNQID\EVKVWPQQPSGRAVLRFEIRTPWGTTLPCCWDPTLVGQDASLEGSLKEHAVEGDCDFQLLKLDGKF\SVVYAKCD\SSQDSAEDV\RKVCQH\CPLLAPL\NDTRVVHAAKSCPGPPFNAQNNGFQFFSLEEISR\AQLVPLPPS\TYV\EFTVSG\TDLLFA*KKATEAAKCNLSGQKSNMGFCK\ATLSEKLGSGQRLQLTCTVF\QTQPVT\SQPNPEGANEAVPTPV\VDP\DAPPSPPLGAPGLLPSWLTPKTTMVLL\AAPPGHQLHR\AHYDLCHTFMGVVS\LGSPFRRKCSHPRKNT/RTVVEA*WLGAAAGATGFLPLFRGGIRHFKV
302	8353	A	128	1445	1778	NLSRNKEVLLFGKNIPWVGWARWLVPGNPNTLGGQGRADHLKLGVQDQPGQHGEIPSLLKIQKLTRHGGVCL*SQ\NHLNPGGGGCSELRSHHCT\CTPAWAME*DSIPKNK
303	8354	A	1280	1	1254	
304	8355	A	1281	1	921	
305	8356	B	1282	70	572	MGKEKTHINIVVIGHVDSGKSTTTGHLIYKCGGIDKRTIEKFEKEAAEMGKGSFKYAWVLDKLKAERERGITIDISLWKFETSKYYVTIIDAPGHRDFIKNMIILNHPGQISAGYAPVLDCHTAHIACKFAELKEKIDRRSGKKLEDGPKFLKSGDAAIVDMVPGKPI*
306	8357	A	1283	1	1410	
307	8358	A	1284	1	1386	

308	8359	A	1285	70	1538	KPKWERKRLIFNIVVIGHVDSGKSTTT\GHLIYKCGGIDKRTIEKFEKEAAEMGKDSFK\FAWVLDKLKAERERGITIDISLWKFETSKYYVTIIDAPG\HRDF\IKNM\ITGDISRLDCAVLDLFA\SGVGEF*SLVSPKNGQ\TREHALLAYTLG\VEQLIVGVNKM\DSTEPPYSQKRYEEMWLREVSTF\IKKIWLQPPTQ*HFVPISWFGIGDNM\LEPSA\NMPWFKGW\KVTRKDGNASGTTLLEALDCILPPTRPTDKPLR\LPLQGVH\KLGGIGTVSSAPMET\GFSNPGMVVTFAPSPR*QRKVKSCRKCTHEALK*SSFLGTNVGLQLSGIVSCQGMFRPWQTVAG*PAKNDPTQWESSWASLVRGDYP*PIPGQNKAPGYAPCIGIGAHGLTFACK\FAELKEK\IDRR\SGKKLEDGPK\FLKS\GDAA\IVDIVPG\RPMCVESFSDYPPLGRFAVRDMRQTVAVGVIKAVDKKVCWSWARSPKFAQKG
309	8360	A	1286	41	601	APSPRRPWGHFTEEDQGLLSTSLWGK\VKCGKNAGRKKPLGKAPLVVL/HPWDPKRSFEQALGNPVPLPSA\IMGNPPKSRAHGK\KVLT\SLGEMPIKHPG*SSKGTFAQA*SELH\CDK\LHVDPENFK\LLG\NVLVT\VL\AIPFSAKEFTPGGCRASWAERWVTWSWPVPCSSRIPLSSLAHDCRAFQG
310	8361	A	129	3	369	PGFPLFSFPEGNGPSKRQTGD*IRCLF*DGKVWECSPPSSSSSPKKRKKAVIF/CVPVQTKCIVVEGGEETLVGDV*V*P*\GSFKHVVAMFPEK/DCLCTLYEASFKTKESRRVDGFVCVRVGT
311	8362	A	1290	2	217	
312	8363	A	1291	1	2283	
313	8364	A	1292	249	433	KWRCGNWPRRTLMPWLH*NFVPTLGQTELQLKEFLSICKEENMKFCWQKQHFEENKKVPAS
314	8365	A	1293	778	1578	PRQVDPSWGFHSRLSGPW/H/WTERDATSLSKGKVPGAPGGHPLWKNDAGRGEINE\LKQVEGEASCSSRKGKLIFFYEWNIKLGWKGIVKESGVKHKGLIEIPNLSEENEVDDT/EEFTTGMILPTKAMATQELTVKRKLSGNTLQVQASSPVALGVRIPTVALHMMELFDPT/S*SSLYSIFTVKEEERVCVLFSLTNKKIIMKWR\WGTWPEEHYAMVALNFVPTLGQTELQLKEFLSIYL*RKVP*NFCWQKQHFEEIKGSLQLTPLNG
315	8366	B	1294	46	386	XIRHESGSRSHSHCSTLSSIGDVAKKLGEMWNNTAADDKQPYEKKAAKLKEKYEKDIAAYRAKGKPDAAKKGVVKAEKSKKKKEEEEDEEDEEDEEEEEDXEDDDEEEDDDDE*
316	8367	A	1295	263	484	
317	8368	A	1296	157	886	TWGKGDLKKPRANMSSYAFFVQTCRGG\HKKKHPDASVNFS/ESFSKKCSERWKTMSA*R/EKGKFEDMAKA\DKARYER\EMKTYIPPQRGRQKRKFKDSQLHPRGPPSGLLSSSCSEYRPKIK\GEHP\GL\SIGDVAKKLGRDVGINTAAD\DKQPY\ERRAAKLKEKYEKDIAAYRAKGKPDAAKKG\VVKAEKSKKKKEEEEGEEDEEDEEDEEIEE\DEEDEEDEEEDDGLMNKLGSGAVFFFSCL
318	8369	A	1297	1	450	CKSRGSNLRVHFKNTRETAQAIKGMHIRTATKYLKDVTLQKQCVPFRRYNGGVGRCAQAKQWGWTQGRWPKKSAEF\LVIEHIQVNKAPKMRRRTYRAHGRINPYMSSPCHIEMILTEKEQIVPKPEEEVAQKKKISQKKLKKQKLMARE
319	8370	A	1298	1	1725	

320	8371	A	1299	278	879	SVKMVRYSLDPGGTPRKSCK/SQRGSNLRVPFKDHS*KLPQAHQGVCHIRKSPTKY\LKDVHLTRNQCVPIPDRY\NGGICKVCRRPKQWG\WTQG\RWPQKGVLNFLLHMLKNAE\SNAELKG\LDVDFLV\IEHIQVNKAP\KM\RRRTYRAHGRINPYMSSPCH\IEM\ILTEKEQIVPKPEEEVAQKKKIS\QKKLKETPTLWHGE
321	8372	B	13	7	177	MSVSARSAAAEERSVNSSTMVAQQKNLEGYVGFANLPNQVYRKSVKRGFEFTLMVVE*
322	8373	A	130	412	616	VFVCLFVCFETGSCSVTQAGGQWCNHGSLQPQPATSAS*IVG\GVAGVYHHFQVFLLLLFNRDEVLLY
323	8374	A	1300	85	266	
324	8375	A	1301	1	1776	
325	8376	A	1302	207	1645	LSQRALRLSPRARSFSLSPACPLPCLLALSLALSSRIEGTLTTACGWGRETEAAAAQGKRGCSGGSRKMSGEDEQQEQTIVD/DSLVVTKYKMGGDIANRVLRSLVEASSSGVSVLSLCEKGDAMIMEETGKIFKKE\KEMKKGIAF\PTSIS\VNNWCM/CHFSPFERSDPGLYSSKEGDLVK\IDLGVPCWMGFIANVASH/SFVVDVAQGTQVTGRK\ADVIKAAHLCAEAA\LRLVKPGNQNTQVT\EAWNKVAHSFNCTPI\EGMLSHSLKQHVIDGEKP*FQNPTDKQK\RAHEKADFEV\HEVYAVDVLVKPQERARPKDAGQRTTIYKRDPSKQYGLKMKTSRAFFSEVERRFDAMPFTLRAFEDEKKARMGV\VECAQT*TCWQPFNVLY*EGRVILFAQFKFTVLAHGPNGPMRI\TS\GPFEP\DFYK\SEMEV\QDAELKALLQ\SSAKSEKPQKKKKK\KASKTA\ENATGGILCSLGNIRRK
326	8377	B	1303	29	200	MSRTRLVCPSLIPFCIYVVDVGFSPGPQSCTSHEPKDIHAKCELAFLHHQRFYKNEGX*
327	8378	A	1304	138	1908	ASRTAVARWECVLQNVRREPSPSRAWPSQLRPIASTATKCRE\CGPGYSTPLEAMKGPREEI\VYL\PCILPETQGTEGPRLSWATVDVDPKSPQYCQVIH\RLPMPN\LKDELHHSGW\NTC\GSCFG*LAPSRGTK\LVLPSFHLLFGIYVGGTWGSEPRAPKLAQGSLSPRDIHAKC\NWAFLHTSHCLASGEVMISSLGDVKGNGKGGFVLLDGETFEVKGTWERPGGAAPLGYDFWYQPRHNVMISTEWAAPNVLRDGFNPADVEAGLYGSHLYVWDWQRIE\IVQTLSLKDGLIPLEIRFLHNPDRCPKAFVG\CALQAPNIQRFLQRTRGGTLFSGRR*FQV\PPRKLKGW\LLPKMPGL\ITTILASPWNDGF\LYFS\NWLAWGP*GKYDISDPQRPALTGQLFLGGSIVKEGP\VQVLEDEEL/TSPSPEPLVVKGKRVGEGP\QMI\QLSLDGKRLNNHHGRCTSALGQSSFYP*SQSGERLLVNAGRVEW*DNSKKGGA*KLNPQLSWVDFGEGAPLPKPLPH*ARYP\GG\DCSS\DIWILNSPPSHPHSLFWALHFPGGPGLSFCISLGTRTLGKHVPTTAKLRLWQCVES

328	8379	A	1305	1	1000	STRAPSPGPFPSSKLAGAYKSWCRRDPRTHSAGAQAAAARSVPIRCPAPTASATMSHHWGYGKHNGPEHWHKDFPIAKGERQSPVDIDTHTAKYDPSLKPLSVSYDQATSLRILNN\GHAF\NVEFDDS\QDKAVLKGGPL\DG\TYRLISVFTFHWGSF*WDKVSEAYCGIKKKYAAE\LTLGHWNTKYGDFGKAVQEPDGLAVLGIFLKVGSAKPGLQKVVDVLDSIKTKGKSADFTNFDPRGLLPESL\DYWTYPGSLTTPPLLECVTW\IVLNF\PFSVSS\EQVFEIP*TLTFNGGGVNPEELMVDNWRPA\QPLKNR\QIKASFQIRWSHSLYSK
329	8380	C	1306	127	435	MAASXNPEVLDITEETLHSRFLEGVRNVASVCLQIGYPTXASVPHSIINGYKRVLALSVETDYTFPLAEKVKAFLADPSAFVAAAXLGCCHHSCSXCCCSPS*
330	8381	A	1307	1	689	KCFI/VGADNVASKQMQQIRMSFRGKAVC*WGKNTMMRKPIRGHLENNPALEKLLPHIRGNVGFVFTKEDLTEIRDMLLANKVPAAARAGAIAPCEVTVPAQNTGLGPEKTSFFQALGITTKISRGTIEILGVRNVASVCLQIGYPTVASVPHSIINGYKRVLALSVETDYTFPLAEKVKAFLADPSAF/VAAAP/VAAATTAAPRAAAAPAKVEAKEESEESDEDMGFGLFD
331	8382	A	1308	68	1111	RTAVMPREDRATWKSNYFLKIIQLLDDYPKCFIVG\ADNVGSKQMQQIRIVPWGEACVLMGQKTM\MGQAHPKGTL*NNPSLWRKLLP\HIRG\NLGFCFTQGGPSLEIKGHVCLANKGLPSWLPVVGANCPHGESHWWPAPEHWSSGPEKTSFFPGL*AITTK\ISQGAPIENPEVNVPAESRTGDQSGEPSEANAA*TCSNISPF\SFGAGSSQPGVSTNGSHLPPLKGLDIHRRNLCIFWLSWEGVRKCCPVSVCQIG\YPTVA\SVP\HSIINGYKRVLA\LSV\EPDYTFPLAEKVKAFL\ADPSAFVVAATCGLLPPQLLLVVVAAPAKVEAKEESEESDEDMGFGLFD
332	8383	A	1309	60	569	STDLEELPTLGWF*KQELIILSCPFVSLTYRERLPANFFKFQFRNVEYSSGRNKTFLCYVVEAQGKGGQVQASRGYLEDEHAAAHAEEAFFNTILPAFDPALRYNVTWYVSSSPCAACADRIIKTLSKTKNLRLLILVG\RLFMWEEPEIQAALKKLKEAGCKLRIMNLV
333	8384	A	131	278	464	YTHILRQLPTLRHEQKSRENCLEEMSLDRFQAAKP\SPTPTHHTYKPTLAGH*KIHAMGLTRA
334	8385	A	1310	62	858	QLRWDSGARAWPRPACLSPLPQRLLSHSPSMAQKEEAAVATEAASQNGEDLENL\DDPQKLKELIELPPFEIVTGERLPANFFKFQFRNVEYSS\GRTKTL\LCYVV*STGARGGKVQASWG\YLEDE\HAACPLQKESFSFNTILPAFRPKPLAVTNVT/WGYVSSSPC\AACADR\IVKTLSKTKNLRLLILVGRLFMWEEPEIQAALKKLKEA\GCKL\RIMKPQDFRILSWE\NFVEQ\EEGESKAFQPWEDIQENFLYYEEKLADILK
335	8386	A	1311	1	727	NTEDQRNEEKAQREANKKIEKQLQKDKQVYRATHRLLLLGAGESGKSTIVKQMRILHVNGFNGDEKATKVQDIKNNLKEAIETIVAAMSNLVPPVELANPENQFRVDHILSVMNVPDFDFPPEFYEHAKALWEDEGVRACYERSNEYQLIDCAQYFLDKIDVIKQADYVPSDQDLLR\CRVLT\SGIF\ETKFQV\DK\VNFHIV*RGVGQRDERRKWIQCFNDVTAIIFVVASSSYNMVIREDN

336	8387	A	1312	2	1271	PVRSSAPRRGHSVASAPRSGLRQVAGRRGAALPCSLAPGCGAAAGASPCPGAGRRRAAGGRCLACECTSLTCAGESGKSTIVKQMRILHVNGFNGEGGEEDPQAARSNSDGEKATKVQDIKNNLKEAIETIVAAMSNLVPPVELANPENQFRVDYILSVMNVPDFDFPPEFYEHAKALWEDEGVRACYERSNEYQLIDCAQYFLDKIDVIKQADYVPSDQDLLRCRVLTSGIFETKFQVDKVNFHMFDVGGQRDERRKWIQCFNDVTAIIFVVASSSYNMVIREDNQTNRLQEALNLFKSIWNNRWLR\TISVILFLNKQ\DLLAEKVLAGKSKIE\DYFPE\FAR\YTTPE\DATPEP\GEDP\R*TRAK\YFIR\DEFLRISTASGDGGHYCYPHFTCAVDTENIRRVFNDCRDIIQRMHLRQYELL
337	8388	A	1313	235	1571	GRPRPPPPQPGRAPPPPPPRMGCLGNSKTEDQRNEEKAQREANKKIEKQLQKDKQVYRATHRLLLLGAGESGKSTIVKQMRILHVNGFNGEGGEEDPQAARSNSDGSEKATKVQDIKNNLKEAIETIVAAMSNLVPPVELANPENQFRVDYILSVMNVPDFDFPPEFYEHAKVLWEDEGVRACY\ERSN\EYQLIDCAQYFL\DK\IDVIKQAD\YVPSDQDLLR/CARVLTS\GIF\ETKFQVDKVNF\HMF\DVGGQ\RDERRKWIQCF\NDVT\AIIFVVGSSSYN\MVIREDTGHNGLAGRL*TSPKGIWDNRWAAAPSLVILFLTKQ/EILLA*ESPLAGNSK\IKDYFPE\FAR\YTTPEGCYSRRPGEGPHGVYRGQVTPFEDEFLRSSNCPVEDGRHYCYPHF\TCAVDTENI\RRVFNGLAVDIHFSGMHLSFSYGAGFKEGEPPKFNLKA
338	8389	A	1314	3	784	
339	8390	A	1315	3	2231	PAMNGLSLSELCCLFCCPPCPGRIAAKLAFLPPEATYSLVPEPEPGPGGAGAAPLGTLRASSGAPGRWKLHLTERADFQYSQRE\RSTIEVFPTKSARGNRVSCMYVRCVPGARYT\VLFSHGNAVDLGQMSSFYIGLGSRLHCNIFTYDSSGYGASSGRPSERNLYADIDATWQALRTR*GRPLVGRVRARWRPRLTLLRRRQVRHQPGQHPSCTGRSIGHGAPPWDWASRYECAAVILHSPLNLGHARRIPRHPRKTYCFDAFPLHSRKVSKINVSPCSSSHGHEGRGDRLSRTGWALYEALPPRRVEPLWVEGAPGTTDIEPLQPVPGAAGVAFILPGAAQPARLAAAPNRPDLSNKAAPGLHPAPAPTQGLACGPPGRPRWRPGLGGARHEWAVDDVQATRRTHSFPFGSKKKIRENGQLKI
340	8391	A	1316	1	1347	
341	8392	A	1317	53	1027	NFRVEAGVRGVQQKETCAFKVLESIGKLG\LALSVAGGAENSALYNVDAGHRAVIFDPIPGQK*QDIVVGEGTHF\LIP\WVQKPQLSNDCRSRPRNCCQSITGSK\DLQNV\NITLRHPSSGPVRQPSFPRIFTSIGED\YDERVLAVPSQLENLK\SVWARFDAG\ELITQR\ELVSRQV\SDDL\TERA\ATFGLILDDVSLTHLTFGK\DFT*AV\EAKQVAQQGKQRRARFV/VLEKAEQQKK\AAIISAEGDSKAAELIANSL\ATAGDGLIELRKLGKLQRTFAYQLSTLSGTSPYLPAGQS\VLLQ\LPQLRAHPCLAPPAGLTWGHSPD
342	8393	A	1318	424	598	
343	8394	A	1319	3	371	

344	8395	B	132	639	1718	MDPLGPAKPQWSWRCCLTTLLFQLLMAVCFFSYLRVSQDDPTVYPNGSRFPDSTGTPAHSIPLILLWTWPFNKPIALPRCSEMVPGTADCNITADRKVYPQADAVIVHHREVMYNPSAQLPRSPRRQGQRWIWFSMESPSHCWQLKAMDGYFNLTMSYRSDSDIFTPYGWLEPWSGQPAHPPLNLSAKTELVAWAVSNWGPNSARVRYYQSLQAHLKVDVYGRSHKPLPQGTMMETLSRYKFYLAFENSLHPDYITEKLWRNALEAWAVPVVLGPSRSNYERFLPPDAFIHVDDFQSPKDLARYLQELDKDHARYLSYFRWRETLRPRSFSWALAFCKACWKLQEESRYQTRGIAAWFT*
345	8396	A	1320	1	1596	
346	8397	A	1321	2	556	WDMMYVTRFASFLRNVLPSFISDWLYVQKMNTWFKHENYGLMPLNGYLKMEIFFIQKRGALI**IYLSIKPSVKEFTETSAVFEDGTMFEAIDSVIFATGYDYSYPFLDETIMKSRNNEVTLFKGIFPPLMEKPTLAVIGLVQSLGAAIPTADLQAWWAAKVFASRWAILSFIHFINEHLLNTCY
347	8398	A	1322	955	1187	IFFFFFFKMESCPFAQAGVQWCDLGSLQALPPGFTPFSCLSLLSSWDYRRPPPHLANFLYF**TWVFTVLARMVSIS
348	8399	A	1323	6345	9041	
349	8400	C	1324	182	433	
350	8401	C	1325	72	254	MVSTQLRQASDPRTTIGRERFELLLRRVDKLMSPRLPTGTLNPHHFWTLSIPQVGRCNAP*
351	8402	A	1326	225	735	GELRVNSLHVSTHFQIPEETDIGWLVSPGQGPARPFEDIQLWPPGSLMAAEPTDQSLEESH*DRWITTFFTFAR\QEGRK\D*PQRSNEFKE\LVTQQLPHL\LKDVGSLDRKN*GAWDVNQDFGGSRFN\EY\WRLIGGAWPKEIRKEEKTLKIQERSKAAWLEDGVGQGRT
352	8403	A	1327	55	391	
353	8404	A	1328	996	1334	WASVGLSGPRSPPSSRPQ*ARPRPGAPASLRQADLGRGWRDRLGAPRPRPPRTGGWRSCCRGRGPGSRPRGARAGLGPGAPGGWRRSRRSWTRARAATRPRAAARGSRTPRG
354	8405	A	1329	1	993	
355	8406	B	133	1154	2233	MDPLGPAKPQWSWRCCLTTLLFQLLMAVCFFSYLRVSQDDPTVYPNGSRFPDSTGTPAHSIPLILLWTWPFNKPIALPRCSEMVPGTADCNITADRKVYPQADAVIVHHREVMYNPSAQLPRSPRRQGQRWIWFSMESPSHCWQLKAMDGYFNLTMSYRSDSDIFTPYGWLEPWSGQPAHPPLNLSAKTELVAWAVSNWGPNSARVRYYQSLQAHLKVDVYGRSHKPLPQGTMMETLSRYKFYLAFENSLHPDYITEKLWRNALEAWAVPVVLGPSRSNYERFLPPDAFIHVDDFQSPKDLARYLQELDKDHARYLSYFRWRETLRPRSFSWALAFCKACWKLQEESRYQTRGIAAWFT*
356	8407	A	1330	72	496	PPWARGSARRPPAWRTVRMPSCHPRMFGAPQKTFLRVSVWSRCRPWGIVMRMM*PMRGQVRRHNSCMAPKTEE*NPTVSATFCCCSFVSCSWPPVTRYSSILFTAAM
357	8408	C	1331	202	378	MTPYLTLFLSPLPPKGEIWGLLLFLTPLGFLLPSLPLLLPCPAPAGVRRQWDGPTEGA*
358	8409	A	1332	1	1541	

359	8410	A	1333	9	345	YLSEVGVSVGIVIRPRQWIRRPEGDPFHGGRLKMDPLRAQQLAAELEVEMMA\DMYNRMTSACHRKCVPPPF\KEAELSKGESVCLD\RCVSKYL\DIHGA*WGKKFDRVVLLQG
360	8411	A	1334	170	842	EHVYKLPSKAKITRPLMLSSARGGAEESERAEPPLRWAFLLLGLGTVVGVDESTAFSWPVCDMCGNGRLEQRPEDRGAFSCGDCSRVVTSPVLKRHLQVS\LDCRSRPQCRVKVKLLQRSISSLLRFAAGEDGLYSQWLIRSLLRIWKEADRRWVPEGPG*RC*LRDTQYGFCQFSGATK*RSVFGKEVGLLNCFVQSVTAHPTSCIGLEEIELLSAGGASAEH
361	8412	A	1335	2	2925	FVLRRRCAQAALPEMPRGSRARGSKRKRSWNTECPS\FPGERPLQGRRAGLRTAGAAASLSEAWLRCGEGFQNTSGNP\SLTAEEKT\ITEKHLELCPRPKQETTTSKSTSGLTDITWSSSGSDLSDEDKTLSQLQRDELQFIDWEIDSDRAEASDCDEFEDDEGAVEISDCASCASNQSLTSDEKLSELPKPSSIEILEYSSDSEKEDDLENVLLIDSESPHKYHVQFASDARQIMERLIDSRTKSPETILHTP
362	8413	A	1336	1	480	NFALEAKNSARAISSVVQTPMGHFTEEDQ/ALTITSLWGK\VNVE\DAGGETPGKGSLVVYP\WT\QRFFDSFGNLVLLPSCPSMGNPQKSKATWPRKVLT\SLGDA\TKHL\DDLKGHLLPKPEVNLHLLTSLHVGS*GTFKLPGEILLVTRFWAIPFSAKEFHP
363	8414	A	1337	52	454	SQTQREPTMVLSPADKTNVKAA/WGMFLSFPTTKTYFPHFDLSHGSAQVKGHGKKVADALTNAVAHVDDMPNALSALSDLHAHKLRVDPVNFKLLSHCLLVTLAAHLPAEFTPAVHASLDKFLASVSTVLTSKYR
364	8415	A	1338	3	616	PTLLVPTDSERTHPWLLSPADKDQRQGPAWG*G*GSHPPSNVAKTLER\MVLFPPPTPKPYFP\HFDL\SHG\SAQV\KGHGK\KVADALTNAVAHV\DDMPNALSA\LSDLHAHKL\RV\DPFNFKLL\SHCLLG*PWAAHLPRPSFTPCGCKASL\DKFPGLFVEAPLLEPSKLPLKLGSLRLAMLLCPFGPFPQPLLPFPAPVPPWSLK
365	8416	A	1339	2	390	GWDWNCVWEPHHWLCQSL/NSVTQAGVQLCNLSSLQPLPLGFKQFSCLSLPSSWDYRNPSLKQQLFSYAILGFALSEAMGLFCLMVAFLI\SLPCEGAVSTSHSSPASGWPRVFLFLYLPRQPGERGWLRV
366	8417	B	134	1029	2108	MDPLGPAKPQWSWRCCLTTLLFQLLMAVCFFSYLRVSQDDPTVYPNGSRFPDSTGTPAHSIPLILLWTWPFNKPIALPRCSEMVPGTADCNITADRKVYPQADAVIVHHREVMYNPSAQLPRSPRRQGQRWIWFSMESPSHCWQLKAMDGYFNLTMSYRSDSDIFTPYGWLEPWSGQPAHPPLNLSAKTELVAWAVSNWGPNSARVRYYQSLQAHLKVDVYGRSHKPLPQGTMMETLSRYKFYLAFENSLHPDYITEKLWRNALEAWAVPVVLGPSRSNYERFLPPDAFIHVDDFQSPKDLARYLQELDKDHARYLSYFRWRETLRPRSFSWALAFCKACWKLQEESRYQTRGIAAWFT*
367	8418	A	1340	13159	14007	VSLSPRLKCSGTISAHCNLCLPGSNDSPASASQVAGITGAHHHARLIFYFFILFYFIFLR/HESDSVTQAGVQLCNLSSLQPLPLGFK\HSLASASQVAGITGTHRYPQLIFVFFFFLF/SFLRQSL/DSVAQAGVQW\RGLGSLHPLPPGFTPFSCLSLLSSWDYKRLPTRLANFLYF**RQGVTVLARMVSIS*PRDLPTSASQSAGITDMSHCAQ/LIFVFLVETGFHQVGQAGLE/PPDLKQSTHLGLPKCWDYRREP

						PRLA\NFCIFSRDGVSPCWPGWSPTSGFK
368	8419	A	1341	1	532	DSGTRDTVLKLLREWYMIISREMFNPMY ALFRTSPGDRVTYTINPSSHCNPNHLSYF KFVGRIVAKAVYDN\RLLECYFTRSFYK HILGKSV\RYTDMESEDYHFYQGLVYLL ENDVSTL\GYDLTFSTEVQE\FGVCEVRD L\KPNGG\NILVTEE\NKKEYVHLVCQMR MTGAIRKQFG
369	8420	A	1342	1	530	AEADAIIQMVREGQRARRQQQAATSESS QSEASVRREESPMDVDQPSPSAQDTQSI ASDGTPQG\EKEKEERPPELPLLSEQL\AL DELWDMLGECLKELEESHDQHAVLETH RTVLNQILRQSTTHLADGPFAVLVDYIR VLDFDVKRKYFRQELERLDEGLRKEDM AVHVRRDHVF
370	8421	A	1343	262	587	PVSKESRVAPLCDFCLPFIQSESSQSEASV RREESPMDVDQPSPSAQDTQSIASDGTP QGEKEKEERPPELP/LLSEQLSLDELWDM LGECLKELEESHDQHAVLVLQPA
371	8422	A	1344	1	2502	MTPPHLPPRRASDDEFENLRIKGPNAVQ LVKTTPLKPSPLPVIPDTIKEVIYDMLNAL AAYHAPEEVGFTSPMLFDERKYPYHLM LQKFLCSGGHNALFETFNWALSMGGKV PVSEGLEHSDLPDGTGEFLDAWLMLVEK MVNPTTVLESPHSLPAKLPGGVQNFPQF SALRFLVVTQKAAFTCIKNLWNRKPLKV YGGRMAESMLAILCHILRGEPVIRERLSK EKEGSRGEEDTGQEEGGSRREPQVNQQQ LQQLMDMGFTREHAMEALLNTSTMEQA TEYLLTHPPPIMGGVVRDLSMSEEDQM MRAIAMSLGQDIPMDQRAESPEEVACRK EEEERKAREKQEEEEAKCLEKFQDADPL EQDELHTFTDTMLPGCFHLLDELPDTVY RVCDLIMTAIKRNGADYRDMILKQVVN QVWEAADVLIKAALPLTTSDTKTVSEWI SQMATLPQASNLATRILLLTLLFEIEVRS WSYPPFQDKDHCKKEKENFEAIAAALA AERESKPPVRDTRESQLAHSKDEPPPLSP APLTPATPSSLDPFFSREPSSMHISSSLPPD TQKFLRFAETHRTVLNQILRQSTTHLAD GPFAVLVDYIRVLDFDVKRKYFHQELER LDEGLRKEDMAVHVRRDHVFEDSYHTA SQSLTHTNDWMYPGFSAQLFSASAFLCR YIVFEGEEGQDAGGLLREWYMIISREMF NPMYALFRTSPGDRVTYTINPSS\HCNPN HLS\YFKFVGR\IVA\KAVYDNRLLECYFT RSFYKHILGKSVRYTDMESEDYHFYQGL VYLLENDVSTLGYDLTFSTEVGQEILITA HPSQSGRSNSQVHLRTSTA

372	8423	A	1345	1	2218	MPQLPGISLPEGVDPSFLAALPDDIRREV LQNQLGIRPPTRTAPSTNSSAPAVVGNPG VTEVSPEFLAALPPAIQEEVLAQQTAEQQ RPELAQNASSDTLMDPVTLIQTLPSDLRR SVLEDMEDSVLAVMPPDIAAEAQALRRE QEARQRQLMHERLFGHSSTSALSAILRSP AFTSRLSGNRGVQYTRLAVQRGGTFQM GGSSSHNRPSGSNVDTLLRLRGRLLLDH EALSCLLVLLFVDEPKLNTSRLHRVLRN LCYHAQTRHWVIRSLLSILQRSSESELCIE TPKLTTSEEKGKKSSKSCGSSSHENRPLD LLHKMESKSSNQLSWLSVSMDAALGCR TNIFQIQRSGGRKHTEKHASGGSTVHIHP QAAPVVCRHVLDTLIQLAKVFPSHFTQQ RTKETNCESDRERGNKACSPCSSQSSSSG ICTDFWDLLVKLDNMNVSRKGKNSVKS VPVSAGENKVSEAQANSGSGASSTTTAT STTSTTTTTAASTTPTPPTAPTPVTSAPAL VAATAISTIVVAASTTVTTPTTATTTVSIS PTTKGSKSPAKVSDGGSSSTDFKMVSSG LTENQLQLSVEVLTSHSCSEEGLEDAAN VLLQLSRGDSGTRDTVLKLLLNGARHLG YTLCKQIGTLLAELREYNLEQQRRAQCE TLSPDGLPEEQPQTTKLKGKMQSRF\SGL GSASSIQAAVRQLEAEADAIIQMSESSQS EASVRREESPMDVDQPSPSAQDTQSIA
373	8424	A	1346	59	6349	KISQYYMHTPISPHPRLLISPSIAPRKVEW TGLKVKSQDRLFAQQLQVELVALPLVLC LAASALGRSTTSFVSLGQPHAAIQTYSQ KWPTAVSASPFLPLRGSGTGNGSSRIPRE SAPEMATAESLVEELSEDAAGGASPGVE LPALGCSELPAAEVSPTASSKNLETICEY AYCMAMLPETGLDPYPKRGFLDLTQERI WTDIPPSPGNIPTTHPLMVRHADHSSLTL GSGSSTTRLTQGIGRSQRTLRQLTAN
374	8425	A	1347	1	746	MAAAGAFRLRRAASALLLRSPRLPARSC RPRPDSITRSPPDVRLPLEKQLKNAINQR GTKGPYIRYYPEVVDHYENPRNVGSLDK TSKNVGT\GLVGAPACGDVMKLQI\QVG *KRGRFVGC*GFKTFSAVGSAI\ASSSLSH LNGVKGKT\VEEALTIKNTD\IA\KELCLS FPWKLALAPMLGLKVAFKAALADYKIE TRTQKKGEAEKKWSPPLGEASSRPTPAV PQPAVPVTLDVSGSRLPSPTEGAL
375	8426	A	1348	2	832	SARGSTVAAIICSPRLTPPRTRDAKAACE RLRRVGVEPQLSRGLALFWSPRPNPPEE MSGGLAPSKSTVYVSNLPFSLTNNDLYP DIFQSIGKSL*KVTNQ*KSKRY/HRKEVK GVAFILFLDKDSAQK\CARA\INNKQLFG RVIKASIA\IDNGRAAEFIRRRNYFDKSK\ CYECG\ESGHL\SYACPKNMLGEQ*/RLP KKKEKKKKKKAPEPEEEIEEVEESEDEG EDPALDSLSQAIAFQQAKIEEEQKKWET QFQGVPSNIRMIPRRTRIKKSTYFQ
376	8427	B	1349	165	520	XNLKLLDNWDSVTSTFSKLREQLGPVTQ EFWDNLEKETEGLRQEMSKDLEEVKAK VQPYLDDFQKKWQEEMELYRQKVEPLR AELQEGARQKLLPVLESFKVSFLSALEE YTKKLNTQ*
377	8428	A	135	885	1173	LSQGPRRHSSAVQPPPHSHRGHHHDDCA SPSQVRQNY\AINRQINVELYASYIYLSM SYYFDHNDVALKNFAKYFLHQSHEERE HAKKLMKLLHFDC
378	8429	A	1350	3	558	
379	8430	A	1351	3	118	
380	8431	B	1352	28	384	MKAAVLTLAVLFLTGSQARHFWQQDEP PQSPWDRVKDLATVYVDVLKDSGKDSV TSTFSKLREQLGPVTQEFWDNLEKETEG LRQEMSKDLEEVKAKVQPYLDDFQKKW

						QEEMELYRQK*
381	8432	A	1353	2	1093	GGASCCLPRSLWLPSSRFRPCPRPGLWVPEVFSRSVPFSSPGCNEWGSTGLLHAEGTPLSQALLLLQVPHGPFRMKAAVLTLAVLFSDG*ARRRHFWQGG*SPPRAAWDRV\K\DLATRVPWTVLKEQRTETYVSQFEG\SALGK\QLNLKAPLTTGDSVDLPPFS\KLREQF\GPC*PRDFLGINLGKRETEGP*GKGR*GKDLWKEVKAKVAALTLDDFQERSWQEEIGAFTRQKV\EPLARKNFQEG\ARPESLHELARRSLSPLGEEMRDRARA\HVDALRT\HLAPYSDELRQRLGAR\LGALRENGGARMGQYHA\QATEHLSTLSEKAKPALEDLRQGLLPVLESFKVSFLSALEEYTKKLNTQ
382	8433	A	1354	119	301	INDKRKKKRPARPGAGGLHLQLCLSQPPQPRGHPAPIPTGQAGPRDSGPGASP*/GRDPPSD*WTPADLGSDPWAGPLPTPQEP*GSRWPSSATVSLSASTATGTPCTYSHGTGWTQRLWTRGLPLSRDPPSD
383	8434	A	1355	1451	2495	RGLAGNFEDRKSAHYVFQTFRGGERRSLELEAHLEGWSLGLRFLLGPLKGPPA\QGHFHPSLPISSWRGAGVPHSR/SPFPTLGIPG*IFPPKPGRRPRGPPRKEDLGPGMVG/RPSGPLPQLPSAVLSADPAGPRPHVPFCEP/SPSHGVRASPGSKWVEEEIGGEEGRQ/PKCRQAFQEAWLMQG/GARGQGLPGS/GCWRINKPSKPSKRGGKGLTCQTFSTNIC*SPPLMPRSLP\GPSFILHLISSQQP*SGLLFIDPIPPEKGRGGLSERWGRAFGDSVACSFQKPTPGPWEVFEQDAWPNPWP/QGPPPENFPKGNPSHSRNIHKGDEQSPVRTKTEPTPWGGKHSQFASR
384	8435	A	1356	2024	2160	KCLCPPR/RCPQPLTPYPC*GVKCPPSEIKYKP*MCPIGCPKPSIQC
385	8436	A	1357	15717	16041	
386	8437	A	1358	41	544	TKLVMMQKLLKCSRLVLALALILVLESSVQGYP\TRKPRHQWVRCNPDSSSAHCLEEKGHMFELLPGESNKIPRL\RTDLFPKTRIQ\DLN\RIFPLSEDYSGSGFGSGSGSG\SGS\GSWFLTGNGNRNYQL\VDE\SDAFQ*QPLGSLDRNLP\SDSQDLGQHGLEEDSMV
387	8438	A	1359	60	401	
388	8439	A	136	961	1051	
389	8440	A	1360	59	420	QQHGRDLWGCRGLIGTDKCVERINEMVNRAKRKAGVDPLVPLR/MLGGVVLISGTGSNCRLINPDGSESGCGGWGHMMGDEGSAYWIAHQAVKIVFDSIDNLEAAPHDIGYVKQAMFHYFQV
390	8441	A	1361	80	384	KEHNFVTSVFARGTMGSGLTHLLGNSLTEKCKLPSWLPITAEGNSLKGFL/LALTQGKEIQAQNFFSSFILMKLRHSSALGGASLLPMDYSANAIAFYSYTFS
391	8442	A	1362	3	124	
392	8443	A	1363	189	242	
393	8444	A	1364	420	557	
394	8445	A	1365	284	362	
395	8446	A	1366	2087	2226	

396	8447	A	1367	1	2956	MNTSQLLEIANQVFVNRAAVSLEENRKENGHQARRNTDLVVSCSNQRGQESLEKLLGRYFYISHLSALAKTMRQRFVTCRHHNARQGPAVPPGIQAYAAAPIEDLQAIRNNITAGVYTPCDIGGNIILCPLAYYQRYQTGVVYTPCDIGSIIILSTSGCPSHTEPRNLTGVSEFLLLGLSEDPELQPVLPGLSLSMYLLTVLRNLLIILAVSSDSHLHTPMYFFLSNPSWADIAFTSATVPKMIVDMQSGVVVSV
397	8448	A	1368	149	1323	PRNEPNSPERRPPLAMDAGVTESGLNVTLTIRLLMHGKEVGSIIGKKGESVKRIREE\SGARINISEGNCPERIITLTGPTNAIFKAFAMIIDKLEER/DINSSMTNSTAASRPPVTLRLVVPATQCGSLIGKGGCKIKEIRESTGAQVQGWRGICLPNSTE\RAITIA\GVPKS\VTECVQADFAWVMLETL/SPSFPQGRSSWTI\P\YQPMPASFPSSSCAGGQD\RCSDVGG\YPHGHP*PGKGPLLDGLFDFKGQHTISPLDLGQA*TRIGKPTSLNVHMMHGGT\GF\AGIDSASPE\VKGYWAKFECIYPKTPHELTI\PNNLI\GCIIGRQADSDLMRSAQMSGAQDQKLA\NPVE\GSSGR\QVTI\TGLCCPVISLAQYLINA\RLSSEKGMGCS
398	8449	A	1369	2	125	
399	8450	A	137	2	804	SSGFPASTVLGRNPALVPHPGRPPIASPPSPLHRTLGLPQGPRRRSSAAQPPPPAAASPLVAAMKTAVPPRKVRQ\NYHQGLKRAAHQPARINPGSSTASYVLPCPMSYLLLTRDDGGL*RTFA\KYFL\HQFSMKEEGNHAEKT**KLAEPNEGGRNLSFKDIQEP\DC\SDWGERGLNA\MECALHL\EKNV\NQSLLELHKTGPLTKMTPHLCD\FIET\HY\LNEQGESHQKNLGDHVT\NLR\KMGAPESG\CAE\YLFDKAHPWGDSDNES
400	8451	A	1370	18	1374	LAEQIVPRGVGIRPPDKADQAPCRSPIRTPAPESWHCDSRQRFRQDSSRMKMRVLGLVVCLVLWTLHSEGSGGKLTAVDPETNMNVSEIISYWGFPSEEYLVETEDGYILCLNRIPHGRKNHS\DKGPKPVVF\LQHGLLADSSNWVT\NLGNSRLGFILADAAIDVWMGNTRGNTWSPKHKTLSVSQDEFWAFSYDEMAKYDLPASINFL\LNKTG\QEQVYYVGHSQGTTIGFIA\FSQMLELAKGLKMFFAWGPVASVAFCTSPMAKLGRLPDHLIKDLF\GDEEFLPQSAFWKVAGVPHLATHVIL\KELCGNLCFLLCGFNERNLNMSRVDVYTTHSPAGTFVQNM*HWSQAVKFQKFQAFDWGSSAKNYFHYNQSYPPTYNVKDMLVPTAV*\TGGHDWLEDVYGVNI*LTQIT\NLVFHESIPEWEHLDFIWGLDAPWRLYNKIINLMRKYQ
401	8452	B	1371	77	471	ANREKMTQIMFETFNVPAMRACPSTPPEDHRHRAGLRRRVTHNVPIYEGYALPHAIMRLDLAGRDLTDYLMKILTERGYSFVTTAEREIVRDIKEKLCYVALDFENEMATAPPPPPWKRATSCQTGX*
402	8453	B	1372	101	391	MCDEDETTALVCDNGSGLVKAGFAGDDAPRAVVPSIVGRPRHQGVMVGMGQKDSYVGDEAQSKRGILTLKYLIEHGIITNWDDMEKNGPHLLHELRV*

403	8454	A	1373	92	1323	LPAQKLDTMCDEDETTALVCDNGSGLVKAGFAGDDAPRAVFPSIVGRPRHQGVMVGMGQKDSYVGDEAQSKRGILT\LKYP\IEHGIITN\WDDMEKI\WHHTF/YTNELRVGFPKEDP/TTLA*PKAPLKFPKANREE/MNEPQIMFETFNVPA\MYVAIQAV/LCSLYASGRT\TGIVLDSGDGVTHNVPIYEGYA\LPHAIHAPWTMAGRD\LTDY\LMKILT\ERGYSFVTTAER\EIVRD\IKEKLCY\VALDFENEMATAAIHPSS\LEKSYELPDG\QVITIGNE\RFRCPET\LFQPSF/LSGMEVGGAFHETT\YNSIMKCYIRHPGRTFYANNV\LSGGT\TIVPLGFAD\RMQERDSPALAPQHP*GSRIHSPPPERK\YSVW\IGGFHPWPRLSTSQQKW/VSPKQEY\DEAGP\SIVHR\KCF
404	8455	B	1374	53	302	MTSALTQGLERIPDQLGYLVLSEGAGLASSGDLENDEHAASAMSELVSTACGLRLHRGMNVHFKRLSVVFGEHTLLETRVLTEX*
405	8456	B	1375	277	573	TSALTQGLERIPDQLGYLSSGDLENDEQAASAISELVSTACGFRLHRGMNVPFKRLSVVFGEHTLLVTVSGQRVFV*
406	8457	A	1376	209	413	EAGRREAEKPLGSSPPLPVPPPRAGAGAHQTGA*RAHSMPRCSRKPQAVLTSSEMALAACSSFSRSPDDASTAPSLSTR*PSTTTKGRGRGSPDRRLKGTFNAAVQPETAGCADQLRDGTGCLLIILQVPR
407	8458	A	1377	116	1253	NPGPVQVGVEGGQEEGPSSKKQAKTRQWSPASITEAPGPKIRFSEPLRPPAGCRHQLASRPRVLP/PSPQTPFCPG/PPSPSSVCSPKDHWRRDTPDRRLKGTFMPRCSRKTAGCAEQLQRWHWLPAHHSPGPQMTPALHLHSVPGSRAGLGFAPAPGSAQKSSG*RCKS*EAC*RDGRPDTLHLQTQVSGLT\WPQVFSFPSQVPSRPPPPYMVLNTDLPEPPSAPTLAPRLPWPSTSHLCYPKGPVLPLWPLPSDP\SSPPFVSARPA/ALPAAPEHPPTDPSPAFSSPSLPFPSPLPPRADRR*GWSAGPPGG/EPHRLGSRDAEPPAGPLAHASSLT1AVFGAGGAPYQIGSFRLQAPVTCLQPLRSSFCLRHWPLAPPLA
408	8459	A	1378	24	364	PTEY/ENL/FPCIKEAF/VVEEWVKETLAVL/WPAKQYPFVTPIEERILMEEGKAFPPSRSTAKQKLDGNPVSPTPV\1GLSPTPNKEEKHLNLCPFEPTGHLDGARDTAGPSWLHHRF
409	8460	A	1379	24	2858	VAGNKRGFPGLDRRTMPLRLDIKRKLTARSDRVKSVDLHPTEPWMLASLYNGSVCVWNHETQTLVKTFEVCDLPVRAAKFVARKNWVVTGADDMQIRVFNYNTLERVHMFEAHSDYIRCIAVHPTQPFILTSSDDMLIKLWDWDKKWSCSQVFEGHTHYVMQ1VINPKDNNQFASASLDRTIKVWQLGSSSPNFTLEGHEKGVNCIDYYSGGDKPYLISGADDRLVKIWDYQNKTCVQTLEGHAQNVSCASFHPE
410	8461	A	138	3	402	HGKIFYFILFYFYFFIFLRRSLALSPQVRTADCS\GAISAHCKL/RLPGFTPFS\CLSLPSSWDYRRP\HPRPANFFLYFLVETGVSPC*PGMGLDLLNS/SIPPRLGLPKCWDYRREPPRPVETFFLKAENVRVNY1
411	8462	C	1380	110	508	
412	8463	A	1381	93	180	
413	8464	C	1382	128	382	MYLGISRRLSSMLTFLAYLHPRERPPHRAPXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXQQWAQGTGISIPRTCTSTGL*
414	8465	A	1383	3	140	

415	8466	A	1384	1	609	
416	8467	B	1385	1	690	MASWDEKDLTVPQPDTRKGSVLRCGLSSRALRWAGRGHVAAGWRPLAPESAGGWGMAAAMVPGRSESWERGEPGRPALYFCGSIRGGREDRTLYERIVSRLRRFGTVLTEHVAAAELGARGEEAAGGDRLIHEQDLEWLQQADVVVAEVTQPSLGVGYELGRAVAFNKRILCLFRPQSGRVLSAMIRGAADGSRFQVWDYEEGEVEALLDRYFEADPPGQVAASPDPTT*
417	8468	B	1386	1	975	MSPPGREQGLLLNLLRPSGLDNAGKTTILKKFNGEDIDTISPTLGFNIKTLEHRGFKLNIWDVGGQKSLRSYWRNYFESTDGLIWVVDSADRQRMQDCQRELQSLLVEEVGSSYPLCTWRFFSYLRIEQMYNLVLYRDIQFPDFCFNSNTDWSKGLKTHARFGNTSLHVAHTDSTNTTNFVDVWRGRTKSLACLLQLSSLTCIYTAGKMRLQDRIATFFFPKGMMLTTAALMLFFLHLGIFIRDVHNFCITYHYDHMSFHYTVVLMFSQVISICWAAMGSLYAEMTENKYVCFSALTILMLNGAMFFNRLSLEFLAIEYREEHH*
418	8469	A	1387	25	353	EVCYYRSSEAFFSELIKVILRHLCSVAGKGLCSIPQLNTREGSVLRRISKRGSPLAVEIEEGHCL\CLPLGTECLGIKP\IVHLLNSEIGEKPPFSPLSPCSSAAFLLLR
419	8470	A	1388	79	467	RPESQRANGVDSGPNLKTVPQPDTRKGSVLKWISKRGKPLAVEIEESHCL\CLPLRTECLGIKP\IVHLFSCTRPVIVPSLELHYDIDSIAHMFVADLLLIITLLSYYIPFYLGFQNAGITGINHRAWFY
420	8471	A	1389	368	611	LCPSHFAPTTLTQSGSSLKTCVVLNSRFKACRAVPGPCLVNQMFASSILG\KSHHHSLVPINQGHNALWKAAG\PLPLKAGY
421	8472	A	139	210	1640	DPARAGTGVGASFRGATWQQGQGRGSACSCTQCPPATCLLTGADAPTSRPWSLLSRLLGHCFSVLTVPAAAPPPPGSL/PEPPRAGPQCP*TRPPLR*PGCSHLAGPHSGSPRPCSLLGASATLYGFRHFLAGPAAQGGGQAVGSQGDHPTRAQPP*WSSPQTPLNLSAAQEFEPRGTCPQTRW*SRPDALPWPRPWEPWSG*AEGWEQE*WRLQPQGTAAPRATSSGYSGSSRGQRARPGPARCGDGGGAGRC\GHVRGRWRQLGHRP/RGSSAPAVCCGTLSAAPPGPQHSLSSL*SSAPGPQWCPHWHPQSGRQG*/SPLPPPPGPG\RPPCAPCSGSPSA*GGCTPGCPTAP*GRRQGRWR*PRTGRLSPLGHLPGCRSQAAVSHHRCWPLLPPPR\PSGPPPPLRSGSSPGG/PLPKGC*CQGGERPGQQHKEAGQGPAQQTWLHPQAPGGRRPSHTGWGGGAPGG*QRRNLA*RPLLP
422	8473	A	1390	441	1178	FVALPQPLCPSHFDPTTLIQSGAHKNMCCIKSRFKRDLGLCRTCLVNKMFTSSILGKSHCHSLVSINQGHNAPWKAAG\PLPFRAGYC\QGFSPCDSLKYG\SWDEKDLTVPQPDTRKGSVLRWISQRGKPLAVEMEEGHCL\CLPLGTECLGIK/PPIVHLFNSEIGE\NRP\MVGG\RHVLQ*CCLG*FL*LPLRCLG\GEKHKSGL/HVHIPVIVLS\LELNYDIDSFAHMFF/SVDLLLIITLLSYYIPFC

423	8474	A	1391	3	1078	TRAAGLRAGVRVPRSPGPSRRMPARSGAQFCRRMGQKKQRPARAGQPHSSSDAAQ\APAEQPHSSS\NPAQAPCPRERCL\GPPTTPGPYR\SIYFSSPKGHLTRLGV\EFFDQPAVPLARAFLGQVLVRRLPN\GTELRGPHRWETEA/YTLGPED\EAAPLQGGWPGKTPR\NRGMFH*KPGD/LWVVYIIYGMYFCMNISSQGDGA\CVFL\RALEAPGKSWRPMRQLRS\TLR\KGTRQARVLKGPPKLCSGP\SKL\CQA\LPINKSF*PEGTLAQDEAVWLERGPLEPSEPAVVGS/APRVGVGHAGEWARK\PLRFYV\RGSPWASVVDRVAEQDTQACAKGLPRQDFLHCLKTRINVLFLEKKKKK
424	8475	A	1392	3	452	
425	8476	A	1393	26	493	NSTDSERTHPWLLSPARQRPTSRPAWGKVGAHAVRSMCAEALERMFLSFPT\TKTYFPHFDL\SHGFCPG*RATGKKVDDSADQTPWPTWDDMPKRRCPP*SDLHAHKLS/RLDPV\NFKAPKATCLAG*PLAAHLP\AEFQPLAVARLPWGQISWGFC
426	8477	A	1394	1	409	
427	8478	A	1395	9	817	HGSSSEQEEDEKNNQSATPIHSGPATTMNSIG*YPTQP\TYPVQSPGNPVYPQT\LNL\PQAPPYT\DAPPAYSELYRPSFVHPGAATVPTMSAAFPG\ASLYLPMAQ\SVAVGPL\GSTIP\MAYYPVGPI\YPTLAPQVLGGKGGYDAG\ARF\GAGA\NGGNI\PSPP\PG\CPP\NAAQLAVMQGANVLVTQ\RKGNFFMGGSDGGYTHLVRNQGHLCAREKTSHTLQHFSQCNCFSHINLKLQFRHMLLGCLSGAQTFRHFSNLIRNHVMVAVPP
428	8479	A	1396	1	367	
429	8480	A	1397	625	2919	
430	8481	A	1398	2	76	HHYAKLGTRAVRRARRCAGWQSYVDNLMCDGCCQEAAIAGYCDAKYVWAATAGGV\FQSITPIEIDMIVGKD\RKGFF\TSGLTLGA\KKCSVIRDSLYV\DGDCTMDIRDKQS/QGGEPT\YNVA\VGRSG\RALVI\VMGKGKVFHRRHTLTRKAYETPLYT*RQAWHEGSAKGSKMCRLAELRG
431	8482	A	1399	149	421	
432	8483	A	14	79	533	SSIMTFLESSAVPPHWTGQDGRVCWTGWIPQCQAGSAPE/RS*VFINSAGQKSADTGWSSSKPQN*HLSSFHQAVVGMIQPSHSQFLMKRKAASPRKLEWEH/LQPLHPMTLLYR*DGKPFR*VLLSTYTYCSSRDRPKSSGKNARRFPAHGSS
433	8484	A	140	885	1173	LSQGPRRHSSAVQPPPHSHRGHHHDDCASPSQVRQNY\AINRQINVELYASYIYLSMSYYFDHNDVALKNFAKYFLHQSHEEREHAKKLMKLLHFDC
434	8485	A	1400	1	1107	
435	8486	A	1401	25	1486	GPQQPHSRSTHASGRPQSLSPVLSLSPDSMSFTTRSTFSTNYRSLGSVQAPSYGARPVSSAASVYAGAGGSGSRISASRSTSFRGGMGSGGLATGV\AGG\LAGMGGIQNEKETMQSLNDRLASYLDRVRSLETENRRL\ESKIRE\HLEKKGPQ\VRDWSHYFKI\IEDL\RAQIF\ANTCGTMPRIRSARIDNA\RLA\ADDF\RVKYEDRSWPMCPVLWRTDIHGLPKVH/IDDTNYHTDLQLETEI\EALK\EELLFQ*RRNHEEGS*KALRRQI\SSSGMNAWRLD\APKSQDLAK\IMADIR\AQ\YDELGSKKNPRGSLDKY\WSQQI\EESTTGGSPQKSAEVG\AVETHAHRSLKRTVPVLGRSTLDSM\RNLKGQLWRTSLREG*RPAYALTRLEPAPTGSLL\HLESEL\AQTRARGTAARPRE

						YEALLN\IK\VKLEAEIAT\YRRL\LEDGED FNLGDALDSSNSMQTIQKTTTRRIVDGK VVSETNDTKVLRH
436	8487	A	1402	36	389	
437	8488	A	1403	204	433	
438	8489	A	1404	3	392	
439	8490	A	1405	1	1314	
440	8491	A	1406	2	279	
441	8492	A	1407	3	1462	TSCSSAAPFAAALARDPNPASPLPEHRPR LHRGPGPPARLAAAMADPKYADLTGIA RNDPDVYETSDLPEDDHAEFDAFAQELE ELTSTSV\EHI\IVNPNAAY\DKFKDKRVG DKGI*FSQIVLGKTKRTGYESGEYEMLGE GLGVKETPQQKYQRLLHEVQELTTEVEK IKTTVKE\SAAEEKLTPVLLAKQ\LAALK QQ/VWVASHL/EGKLLGPDAAINL\TDPD GRPGLRRLLLQ\LEATKNSLGGSRGKTPG TPPD\SSLVTYELHSR\PEQDKFSSSLPKS QKLEKRL\TEL\ETAVTLLIQDAQNPLSAG LQGACLMETVELLQAKVSALDLAVL\DQ V\EARL\QSVLGK\VNEI\AKH*SLC*EGAG YTKARLHQLIIETITALGAPLPSTLPGAGC RRLVTHQSSLHEASPCQFGQLLDT/HLDT TQPM\IANFLGRTNTNPL*PQVADKPLRE NLAHQLKGNFAQQ*RNG*KKLGKSEAH LGKLEEPGG
442	8493	A	1408	1	4629	
443	8494	A	1409	96	721	PGQLSSLTPPRPASLLPWRAAYLFL\LFLP AGLLAQGQYDLDPLPPFPDHGQYTHYM DQIDNPDYYDYQEGTPR\PSEGQFQ\F\QS QQEVQQGVIPSPNPRAQGNAEL\EPTEPG PLDCREEQYPC\TRL\YSIHRPCK\QCLNE VCFYSLRRVYVINKEICV\RTVC\AHE\EL LRA\DLCSGTSFSKCGR*WASSGL\CQSV\ AASCA\RSCGSF
444	8495	A	141	170	737	IVTATCLWGSLVLTHSVFPFQSYYFDRD DVALKDFAKYFLHQSHEERGTCLRNLM KLQNPRG\GLIFLQDIKVNKRS*GCHTSSS GSVRVSEIT*TSNCPYKVMIHWAFAFCA FLGLPSKLN*ANSNVPFAKTWWLEMMG LLTSRLVGRDALTYSHS\KPDCDDWESG LNAMECALHLGKNVNQSLLELH
445	8496	A	1410	118	256	MFCFFLKPIAEAPFKFDMELDDLPKEK\L KELIFEETARFQPGYRS
446	8497	A	1411	457	839	AVGGFWGCPRVELHMLVHITPLSHFKC GCFSNHVPCLRI*QRGTLRL*MRKYTILF PSTACQHLKFIFQPTV*QFVIKPPGAHDV KHCSVLKYSNISDTAESDCQKKLSTNSC LELYPYFTDLFKYL

447	8498	A	1412	310	1784	RRRPRQPTMAAAVVGGRGPEVWSAGTLFDVGPRYTNLSYIRRGRLTTCVCSAYDNVNKVRV\AIKKISPFEH\QTYCQRTLREIK\ILLRFRHENI\GINDII\RAPT\IEQMKGCI**YRDLMETDLYKLLKTQHL\SND\HIWYFLYQILRGLKYIHSA\NVLHR\DLKP\SNLLLNT\TCDLKICDFGL\ARVADPDHDHTGFLTEYVATRW\YRAPEIML\NSKGYTKSI\DIWSVGCIL\AEMLS*QGPSFQGKHYL\DQL\NHIFGVFLGSPSQE\DLNCIIKF*KLGNYLLSSHTSKIMVPLEHACPQNADSKSSGTLLGQNCLTFNP\HKRIEVEQALA/HTPYLEQYY\DPSD\EPIAEAPIQVRPWKLDDLPKEKLKGTNFLKRLARF\QPGVQILNFVQTKGSEGLDVLRHRCSSSQFLTPGPVFQPCLGLSTLTPLNPFGRGRFLGSCGFYGFSKISFSPGGFLLGQPCCCVHPLVTLRAVCTSVHLTAYCCFSH
448	8499	A	1413	2	294	GNKMAAPKGSLWVRTQLGLPPLLLLTMALAGGSG\TASAEAFDSVLGDTASCHRACQLTYPLHTYPKVGPVRSGLRPFPCSPFLGSPHVCRLWQPGC
449	8500	A	1414	366	1412	QRGTRWRRERGSLWVRTQLGLPPLLLLTMALAGGSGTASAEAFDSVLGDTASCHRACQLTYP\LHTYPKEEELYACQRGCRLFSICQFVDD\GIDLTRTKLECESACTE\AYSQSDEQYALPFLGCQNSACHFAE\LRQEQLYVPRWPKMAPTFFL*LLGEGSFWELT*WDSAQ\SFITSSWTFYLQA\DDGKIVIFPV*SQKSQYAPHFGAREPTNFEENHLLSKMSSDLQMGKFHQAHQGIFLKNEERDGLFKKPSILNSGWILTT\TLVLS\VMVLLW\ICCATVATAVEQYVPSGEAGVTMGDLEFMNEQKLN\RYPASFSCGLVRSKTE\DHEEAGPSYLPKVNLAPFLEI
450	8501	B	1415	76	384	MSGWGVLSGRLNPAAREKDVERFFKGYGRIRDIDLKRGFGFVEFEDPRDADDAVYELDGKELCSERVTIEHARARSRGGRGRGRYSDRFSSRRPRNDRRNAPP*
451	8502	A	1416	3	229	
452	8503	A	1417	152	536	PDIMSGCRVFIGRLNPAAREKDVERFFKGYGRIRDIDLKRGFGFVEFEDPK\DADDAVYELDGKEL\CSERVTIEHARARSRGGRGRGRYSDRFSSRRPRNDRRNAPPVRTENRLIVENLSSRVSWQVC
453	8504	A	1418	771	1383	ILIEYKCGKCHVCTLSNIFSFSSLVFFISCDCLCVPFPLLCLTQLSCVKDLKDFMRPAGE\VTFA\DAHRPK\LNEGVVEFASYGDLKNAIEKL\SEKEINGRKIKLIEGSKRHSRSRSRSRSRTRSSSRSRSRSRSRSS\KSYSRSRSRS\RSRSRSRSDVPVLLSRSPRA*EEPRNRGSSSRSKSPASVDRQRSRSRSRSRSVDSGN
454	8505	A	1419	236	1377	PDIMSGCRVFIGRLNPAAREKDVERFFKGYGRIRDIDLKRGFGFVEFEDPRDADDAVYELDGKELCSERVTIEHARARSRGGRGRGRY\SDRFSSRRPRNDR/RVCEGWMAALNNYW*G*PFKIQESLAVMILGPAV*SVLLFPR*PIVLDESI*VIEHKSIDGSH*NGL*YLMA*TCPQLNTSAVIAFLPL*IRIFFLRNAPPVRTENRLIVENLSSRVSWQDLKDFMRQAGEVTFADAHRPKLNEGVVEFASYGDLKNAIEKLSGKEINGRKIKLIEGSKRHSRSRSRSRTRSSSRSRSRSRSRSRKSYSRSRSRSRSRSRSKSRSVSRSSPCPEKS\QKRGSS\SR\SKSPSHLWNRPEVPGPRSRSQIQLDQWPIKPVK

455	8506	A	142	1	809	VVGVSCFNSAWTEPGARSPPRPAAHSQPSVTSSPHPRTAPRPPPPLQRREATAAGRRLSLVAAMTTASHLAGCAKNYHQGLKRPPINRQDQPWKLYGLLRFTLSHVLTNFDPRMMLAFERTFAKYFLHQFSMKEEGNHAEET**KLQN\QRGWPEFFL\QDIKETQTCD\DWEERGLNA\ME\CALHL\EKNVESSHLLELHKTGQLDKNDPPFCVTFIET\HY\LNEQ\VKGHQRIWGDHVTNL\RKMGSAPNLAWAKYLFDHSTSLG\DSDNES
456	8507	A	1420	568	770	PDIMSGCRVFIGRLNPAAREKDVERFFKGYGRIRDIDLKRGFGFVEFEDPRDADDAVYELDGKELCS\ERVTIEHARARFTRLGRGRGRYSDRFNNSAELRNDRRNAPPVRP\ENRLIVENLSSRVSWQDLKDF\MRQAGE\VTLPDTTRLNL\NEGVVEFASMGDLRNAIEKLSGRELNGRKIKLIERPAKRPQ*VQQSRSSDPGTQKSPLGPRSRSPSPVVANLNSRSKK/RRGSREPGSPEPSPRSC*VGSSPVP*ERFFKGYGRIRDIDLKRGFGFVEFEDPRDADDAVYELDGKELCS
457	8508	A	1421	1	1317	
458	8509	A	1422	1	816	
459	8510	A	1423	19	2867	PPDPLPGLPCPPGGPPLPAFGGGWGGARGSWHWSSRACSRRRRLVHAPRAPLLPRAAAEKAKRPAGARQMGLKARRAAGAAGGGGDGGGGGGGAANPAGGDAAAAGDEERKVGLAPGDVEQVTLALGAGADKDGTLLLEGGGRDEGQRRTPQGIGLLAKTPLSRPVKRNNAKYRRIQTLIYDALERPRGWALLYH\ALVFLIVLG\CLILAVL\TTFKEYETVSGDWLLLLETFAIFIFGAEFALRIWAAGCCCR
460	8511	A	1424	2	508	PDSSGPHRLRENPPMVAVSCPTKTNVKGPPGGKVGAHAG\EYG\SEALE\RMFLSFPT\TKTYFP\HFDL\SHGLCPRLKGHG\KKVADALT\NAVAHVD\DMP\NGVVRP*SDLH\AHKL\RVDPVNFKLLSH\CLLVTLA\AHLP\AEF\TPAVPRPPWDKFPWLSVKHRCLTFKYR
461	8512	C	1425	257	358	MILLVFLPXHQVFLERXQESEILHHLNTLADVL*
462	8513	A	1426	64	467	PAAWLPILVAARQLTVQMMQNPQILAALQERLDGLVETPTGYIESLPRVVKRRVNALKNLQVKCAQIEAKFY\EEVHDLQRKYAVLYQPLFDKRFEIINAIYEPTEEECEWKPDEEDEISEELKEKAKIEDEKKD
463	8514	A	1427	1	795	
464	8515	A	1428	1	836	
465	8516	A	1429	1	410	ARAKTYRMRSEPDDSDPFPFDGPEIMGCTGCQIDWKKGKNVTLKTIK\KKQKHMGRGTVRTVT\KTVSNDSFFNFF\APPEVPESGDL\DDDAEAILAADFEIGHFLRERIIPRSVLYFTGEAIEDDDDDYDEEGEKSG
466	8517	A	143	776	1115	APGVPDKPRQQNE/IPVSTKNM*LGVGDCLRGLRQEDHLNQEVPGCSEP*CHDQATALPAWATQQDPVSKKKKKKWWREARKGKPQ*GDGEKDSTTHSWL*RWRSLKSRITVSL
467	8518	A	1430	502	765	LQKQKQANKQQIT*K*ACQMV/SNSSFPGKQKVDPTTKKRCLVNGGLNLKIQL/IIQANF*KSRFIHLTVVPVTILSQVTLQLTMSPKTQ

468	8519	A	1431	58	1335	VTACAAPAAWLPILVADIWSSYNMADIDNKEQSELDQDLDDVEEVEEEETGEETKLKAR\Q\LTVQMMQNPQILAA\LQERLDGLV\ETPTGYIESLP\RVVKRR\VNALKNLQVKCAQKETQ\FYEEVHDLERKYAVIYQPLFDKRFEIINAIYEPTEEECEWKPDEEDEISEELKEKAKIEDEKKDEEKEDPKGIP*IW\LTVFK\NVDLLSDMVQEHDEPILKHLKDIKVKFSDAGQPMSFVLEFHFEPNE\YFTN\EVLTKTLR\MSSIPD\DSDPFFF*MEPEH*GCTGCQIDWKKGKNVTLKTIRK\RPKPQGTWGQFRTVN*NQFPNDSFSNFFCPLLKFLESEDRND\DAEAILAADFEIG\HFL\RERIIPRS\VLYFTGEAIEDDDDDYDEEGEEADEEGEEEGDEENDPDY\DPKK\DQNPAECKQQ
469	8520	A	1432	1	645	PLKRSDGCNDGRPTRPPTRPDTTVFTSNLKQTLLVHLTPVE\KSAVTALWGKVNVDE\VGGKALGRLLVVLPWDPKRSFQSPLGESVPTP*MAKEKVLGCPLVVGLASPGTTLKGHLCPHWSELALLTSLPRGIPEELQGSWGKRAGSCVAWAQSTFGQKNFNPNKLQGLPNQENWLAWCWLNALGPTSNHLSLAFLAGPISN
470	8521	A	1433	240	461	
471	8522	A	1434	2	206	
472	8523	A	1435	2940	3296	
473	8524	A	1436	189	736	ENKISSVFKADFLPPAPCSLPGLEVSVSPKGKNTSGRESGFGWAIWMEGLVFSRLSPEYYELA\RPHLRDEEKS\CPC\LAQE\GPQG\DLLTKTPELGP*ITRTC\LTI\VQKT*RKMVDKP\TQRSVSNAATRVCRTGRSRWRDVCRNFMRRYQSRVTQGLV\AG\ELAQQNLVSTSRLCIPSTGPL
474	8525	A	1437	3	452	
475	8526	A	1438	3	485	PTLLVPTDSERTHPWLLSPADK\TNVKGPPGGKVGAHAVRSMCAEALERMFLSFPTTKTYFPHF\DLSHG\SAQV*GPRARKVADAL\TNAVA\HVGRTLPNALVPPLSDLHAHKL\RVGPGSTFKLLKATCLAGLTL\AAHLPARVQPLAVASLPWDKVSWASC
476	8527	A	1439	217	474	RTCASLKSLHRPHGSHGHGQRGGFL*VFSSSFDSSDGVWQVCSPGGQIPPTCPHHCCDPESPDSSSGPPVPWHLPCAVQGPSPGGL
477	8528	A	144	1	419	
478	8529	A	1440	569	737	REHPVAGLQEHLQGGGSGQQDLRG*WAYFS/HR*SRKVPTSW*RRWKMVAPWAARRV
479	8530	A	1441	520	1319	SWPQVPKTNKIEPRSYSII\TSCGI\RRLGPALNTLIFSK*NASGPAGHSAKSIEGAPRGKGRGRAVARLAADRPPAPKIQLPSFV/LRSTL*YPLLELE\LPRLLATHLPSNGS\SLK\DLKWT\HSNYRASKEP\CIVIF\VTTSPG\REWVICAPAAFLG\CGSRFSGSPLPE\SNP*FPV\TRGHHGRHGDYHRKLIGQTFEWVVVRRHGG\RAIGPRLSRVTKAAGARPPAGAGEG/LDRVGFDLINA\PSPPAKGVSARRHVLALELPQLSK
480	8531	A	1442	2	239	RKTQTTRRGPGLWAGPGG*RGGWWSRRLLLAAGFLGTHPGSTHPGLQQPRFKWDHTRSSQGAFIFTFFPRGGQEHSFTS
481	8532	A	1443	234	491	

482	8533	A	1444	126	890	PRSIGEGLGPSLLCGSGRARFSSGGMSGPRLVVLSGPSGA\GKSTLLKRLLQEHSG\IFGFSVSRESRALVEG\TTRNPRPGEGRRQKITYFVTREVMQRDIAAGDF\IEHAEF\SGNLYG\TSKV\AVQAVQAL*PHRVCLDV\DLQG\VRNIRPTDLRPNLHLLFSPPFTATCWKQPGFRQPQQLETEGRAWLKAGLLLAQA\DMEEPAKEAPALF\DVVHPLNDQPGTQA\YAELKEALSEEIKKAQRTGALRLAVCSR
483	8534	A	1445	978	1440	AGVGVRGTTGRLVVRKFLTLIFGNPLFLVAPPKPHSEWSQRLTY\RRRPSPYNTA\SNKT\RLSPNPDGNRICLPFIPKKVGKAPQSLHVVCAPGRLRG\VRAVRPKV/LL*RLSKTKKHVSRAYGWFHCVLKCGRD\RIKACFSLIGGSRKIRCGKSV
484	8535	B	1446	43	674	MDWTWSILFLVAATTGVHSQVHLVQSGAEVKKPGASVKVSCKASFNSFDTYGFNWVRQAPGQGLEWMGWVSAFNGDTNYIRKLQGRVTMTTDSSTSTAYLELRSLKSDDSAIYYCAATNSDKYFWGQGTLVTVSAASPTSPKVFPLSLCSTQPDGNVVIACLVQGFFPQEPLSVTWSESGQGVTARNFPPSQDAFGDLYTTSSQLTLPATH*
485	8536	A	1447	3	1637	SPGIFRGFQSVIRTEQRELTMESGLNWLLLVAVLKGVQCEVQILESGGGQVQPGGSRTLSCAASGFIFSNYVMTWVRQAPGKGLEWVSSTAASGANTFYAESVKGRFTVSRENSENMMYLQMSSLRDEDTGIYYCAKDGDVPNLGVAWIVAGPGNVRPRKWFDAWGQGTTVTVSSASPTSPKVFPLSLCSTQPDGNVVIA\SCLVQGFFPQEPLSVTWSESGQGVTARNFPPSQ\MASGDLYTTSSQLTLPATQCLA\PKSVTCHVKHYTNPHPDVDG\PCPVPSTPPTP/CSLNSTYPISLMLPPPTVTAPTGPSKDLFLGSEANLTCTLTGLE\NASGCHFQSEGLQVGKSAVQGP\PEA*PSVAAYSVVQLSCRGWREAMEPLVRPFTCTAALPRSPRTRANRPPSSKSGKHISGPEGPPCCRPPSEELALNELVTLTCLAR\AFSPQGPCWVRWLQGSPKLPPRKST*LG/PFPAGAQARAPTTFAVTSILGR/VQPEDWKKGDTF\SCMAGH\EALALAFTQKTIDRLAGKPTHVNVSVVMAEVDGTCY
486	8537	B	1448	113	249	XAAMTTASTSQVRQNYHQDSEAAINRQINLGALRLLRLPVHVLLL*
487	8538	A	1449	846	1193	VMGPKPLPGIVPEFLKNWPRPSGLLIEFCPHWDTTDMTSN/CLV*EENYSEQCLELLNPVGMDLILRGDCESYHGHKPNRKLGSQHLSDQAALTGRLSSPCLMKRRRSASFRFTQAG
488	8539	A	145	3	1363	HASGITMAAGTLYTF\SVNWRAFKALIAAQYSGAQVRVLSAPPHFHFGQTN\RTPEVLRKFPAGKGPAFEGDDGFCVFESNAIAYYV\SNEELRGSTPEAAAQVVQWVSFA\DSDIVPPASTWVFPTLG\IMHH\NKQAT*ECKGRK*GRILGLV\DAYLKTEDFCWGANVERLSGITVV\CTLLWLYKQVL\EPSFRQAFPNTN\RWFLTCI\NQPQFPAVLGGSETCVRRLAPFGA*KVLQRPQPKK\DTPR\KEEGFTGKKKQKPQAERKEEKKAAAPG\PE\EEMDECEQALAAEPKAKDPFAHLPKSTFVLDEFKRKYSNEDTLSVALPYFWEHFDKDGWSLWYSEYRFPEELTQTFMSCNLITGMFQRLDKLRKNAFASVILLG\TNNSSSISGVWVFRGQELAFPLSPDWQVDYESYTWRKLDPGSEETQTLVREYFSWEGAFQHVGKAFNQGKIFK

489	8540	A	1450	2	1087	AIEHCQSGDNPESRRGFLLQQWLGRNPALVPHPGRTGHSQPPVTFHRHPSDCQRSPAGRFKGGPSHRGQPPPFHKSPPMTTARPTSQ\VRQN\YHQ\DSEAAINR\QINLE\LYASYVY\LSMSYYFDRD\DVALKNF\AKYFLHQSHEER\EHC*ENLMKACRTNEGWPNLSFQDIKETKTCDD\WESGAECQWKCALH\LEKNVESSHYWNLHKL\ATDKN*PPICVDFI*DTFTLNEQ/V*KAIKRIWGDH/V*PKLWRKMGSAPNLGFGEYLF*QSTPW\ETVIMKAKPRANFPNSRGVTFLVTKAVHACWGFLYLFYKLYQNIHLSSLICTIPSNKEIWYPGVVFEVLDESEIYPGYLPDSLSAVVQF
490	8541	A	1451	24	452	APSPDAMG/HSLWGKVNVEDAGGETLGRLLVVYPWTQRFFDSFGNLSSASAIMGNPKVKAHGKKVLTSLGDAIKHLDDLKGTFAQLSELHCDKLHVDPENFKLLGNVLVTVLAIHFGKEFTPEVQASWQKMVTGVASALSSRYH
491	8542	A	1452	41	542	APSPRRPWGHFTEED\KATI\TSLWGK\VNVE\DAGGRKPLGKAPWLSTPWTQRFFDSFGNLSSASAIHGQTPKVKAHG\KKVLT\SLGDA\TKHLDDLKG\TFAQA*SELH\CDK\LHVDPENFK\LLG\NVLVT\VL\AIPFSAKEFTPEGCRASWAERWVTWSWPVPCSSRYH
492	8543	A	1453	1	1233	
493	8544	A	1454	233	884	ESPGVGCSARRGPRPRSPGPPPAAPGTPRPHGIPLYTRAGHQ**GEIRRRPCTFISKFLRPQGGSASERQLPDLQARAWQELLGRPFNKH\HWFPR*SPCKGIGVTRCI\RINP*KWIPLIGPGQHSAIGLSSQELFRLLP\SELTL WG*PPIEVSYRIGEDGSHLCACMKPSPA\GGST\QNQT\NVQMV\DS\RISCKEELLLGRTEPFPKTTNMMTVSG
494	8545	A	146	3	452	AVPGPGFGLSPTMVTLAELLVLLAALLATVSGY\FVSIDAHAEECFFERVTSGTKMGLIFEAEDGGFLDIDVVITLPDR/RKIKPRLLKKKGQ*TYRSFMDVTFKLCYNLRMSWMNPNIRNHNHWLLLTSIKFLITQFRSSLSYLSSCIQSE
495	8546	A	1460	255	2154	LAEPEVATDSGQQADLPAEGGDPRAEASCSVLHSKPHAMADSRDAASDQMQHWKEQRAAQ\KYLGVDLLGHKKADVLTTGAGNPVGDKLNVITVGPRGPLLVQDVVFTDEMAHFDRERIPERVVHAKGAGAFGYFEVTHDITKYSKAKVFEHIGKKTPIAVRFSTVAGESGSADTVRDPRGFAVKFYTEDGNWDLVGNNTPIFFIRDPILVSFLFSDRGIPDGHRHMNGYGSHTFKLVNANGEAVYCKFHYKTDQGIKNLSVEDAARLSQEDPDYGIRDLFNAIATGKYPSWTFYIQVMTFNQAETFPFNPFDLTKVWPHKDYPLIPVGKLVLNRNPVNYFAEVEQIAFDPSNMPPGIEASPDKMLQGRLFAYPDTHRHRLGPNYLHIPVNCPYRARVANYQRDGPMCMQDNQGGAPNYYPNSFGAPEQQPSALEHSIQYSGEVRRFNTANDDNVTQTSLYLTYRFMENIEKVRAFYVNVLNEEQRKRLCENIAGHLKDAQIFIQKKAVKNFTEVHPDYGSHIQALLDKYNAEKPKRSLAFIRVTRSSLDEDSPVLDVQMQASGFKIENPTFYSRLCNNFNAISPGENEALTIEQMGSTEANCLLRNSVQLVAFVIEITSRKSDIVERHKCAWT
496	8547	B	1461	129	321	XYWMLCSKAEGCCSGAPKAVGVVIWSTTLIVLHAHRAVTLVVGHSSTGRDSSQVYEDNWVPGRWR*

497	8548	A	1462	70	2954	RMLITGSPALGSAIPGTPGRRGEALQLLGQSGTLPFRTLLGISGLQASFGEPCSEPIGLPILACLAPSSQSEGSPPEGAGRGGGADWLSLKSPRTRGNRQICLLRVETHEPRPPAVFCTANRTLWLTAGIPPATRCSTGRSSGPRRIEMRACTTSIQGNNVQDKWKSNCEVPDVECACTFLESLKPGWLGQSKQGAKRSGGDECLQSSHLWEFVRDLLLSPEENCGILEWEDREQGIFRVVKSEALAKMWGQRKK
498	8549	A	1463	3	452	
499	8550	A	1464	2	521	PDSSGPHRLRENPPWCLSPADKTNV\KAAWGKVGAHAVRSMCAEALERMFLSFPTTKTYFPHFDLSHGF\AQV*GPRARKVADALD/TNAVANVGRTLPNALVRPL\SDLHAHKLSGGTRFNFKAPKGHLPCLGEPWAAHLPRPSFNPWRLQRLPWGQSFLGFLLKHRCLNLPNYR
500	8551	A	1465	154	678	PPLHLRDCFSPPGRALSPVGLYPYR\RSVP\TWLKLT\SDDVKE\QIYKL\AKKG\LTPS\QIG\VILRDSHG\VAQVRLG\TGHDTFKI\LKSKGLDPDLPEDLYHLIKK\AVAVRKHLERN\RKDKDAKF\RLILIE\SRIHPFWLRYYK\TKR\VLPP\NWEI*NHLTASALGRINLVWCTPSK
501	8552	A	1466	23	636	FSYLPPGPSHGTWGLWELQFKMRFGVCRHLMEDSMDMDVSPLR/PQNYLFSCELKADKDDHFKVDNDENEHQLSLRTPTVSLGVFEITPPVLLWLKCGSGPVHISGQHLVAVEEDAESEDEEEEDVKLLRISGKTKTFMATNGKEYKHYKISSEKSLDNKYKTRTPGFQAFGFEDLHPWPLGSQAFYLSLRVTPPVFLVLRLLDFD
502	8553	A	1467	3	618	AKD/ELHIVEQGHDIRGRSIKIT/LATLKMS/VQPTFS/LGGFEIQPTVV*GLKCVSGPCHISGQHLVA/VEEDAESEDEEEENVKLLSISERRSAPGVVSMVPQKKVK\LAADEDDDDDDEEDDDEDDDDDDFDDEEAEEKAPVKKSIRDTPAKNAQKSNQNGKDSKPSSTPRSKGQESFKKQEKTPKTPKGPSSVEDIKAKMQASIEKAH
503	8554	A	1468	1	1689	
504	8555	A	1469	3	535	DSVLRGCSLEQRSFISVRLLSYLSACRHPMEDSMDMDMSPLRPQNYLFGCELKADKDYHFKVDNDENEHQLSLRTVSLGAGAKDELHIVEAEAMNYEGSPIKVTLATLKMSVQPTVSLGGFEITPPVVLRLKCGSGPVHISGQHLVVYRRKHQELQAMQM\DCRALSTS*ASSAPRPS
505	8556	A	147	90	512	VQGLGVERVPLGSHRGWMGPPRPLLSPQERASCLLLLLLPL\VHVSATTPEPR\ELDDEDFRCVLQLSPEPQPDWPEALHRASAVQA*ISAGGSHLQSSFLIGLRLLKTVTVLLWPLFVLICVYLSVYLPFRLCLDTLSCVV
506	8557	A	1470	1	1025	SVLRGCSLEQRSFIYGRLLSYLSACRHPMEDSMDMDMSPLRPQNYLFGCELKADKDYHFKVDNDENEHQLSLRTVSLGAGAKDELHIVEAEAMNY\EGKSN*T*HLATLKMS\VQPTVSL/GGAFEITPPVVLRLKCGSGPVHIKWTSTYVAVEGKMQKSRRLKKEGRLVKLLKVYLGK\RSAPWKVGSKVSTEKKVKTLLA*WKDDDRMNDEE\DDD\EDDDDDDFDDEEAEEKAP\VKKSI\RDTPAQKCSESQNQNGKRLQKPSFTPKNQKGQESFQETRKKLLKTPKG\P\SSVEDIKAKMQASIEKGGSLPKVEAKFINYVKN\CSRMTDQEAIQDLWQWRKSL

507	8558	A	1471	3	490	SSGPTRLRENPPMVAVSCPTKTNVKA\AWGKVGAHAVRSMCAEALERMFLSFPT\TKTYFPHFDLEPRFLPRFKGHGKKVADALTNAVAHV\DDMPKRAVPPLSDLHAHKF\RVGPGSTFKLLKPLALLG*TLGRPTSPSEFQPLAVARLPWGQSFLGFLLKQPC
508	8559	A	1472	35	1288	
509	8560	A	1473	1	1641	
510	8561	A	1474	212	369	HPVTVYLLLGYLLFQLPCGSEFSTSETHGHSADRLG\AAFAVSRLEQDEYAPG
511	8562	A	1475	63	255	VLMFSSSHG*GYQSS\RLQCKLQIVQLIQDILLFFSF*IPE*LLS*LTPLKIFPLHQNGPSDFVS
512	8563	A	1476	169	391	
513	8564	A	1477	85	1534	KSSHCIKMGPQIFHKTSELVLPATSCPSCPDQNEEDVSQTQYKECCG\GGWCSHSIFAVW\HFI*RPDAT*FGLEQRLTGLLASGPVSLREVV*LYSSLGTVISGK*KTSNVG*RGLALGSWAFSDKYSWFTMFTWACISGPTKAL\TTGV\GLIAF\GQCDVIVAGGVELMSDVPIRHSRKMIKLMLDLNKAKSMGQRLSLISKFRFNFLAPELPAVSEFSTSETMGHSADRLAAAFAVSFL\DQDEYALRSHSLSKKAQDEGLLSDVVPFKVPGKDTVTKDNGIRPSSLEQMAKLKPAFIKPYGTVTAANSSF/LLTDGASAMLIMAEEKALAMGYKPKAYL/RRDFMYVSQDPKDQLLLGPTYATPKVLEKAGL\TMNDIDAFEFHEAFSG\QILANF\KPMDSDWFAE\NYMG*KKPRFGLPPLWRRFNNWG\GSLS\LGHPFGT\TGCR\LV\MTAANRLRKKGGQYGL\VAACAPG\GQGSATDYVEAYPK
514	8565	A	1478	2	359	
515	8566	A	1479	1	585	PRGVIGHGPLGTSFIGKYGCGDYWVKAFLDRPSQPN\QGPKKNFE\VWDLVDVNTP\DLMA\PVSAKKERKVSCMFIPDGRVSVSARIDRKGFCEGDEISIHADFENTCSRIVVPKAAIVARHTYLANGQTKVLTQKLSSVRGNHIISGTCASWRGKSLRVQKIRPSILGCNILRVEYSLLIYVSVPGSKQVFIKAL
516	8567	A	148	98	440	KDDTNTKCW*AWNCSSTRAH\WKRTLTLLG\RLLTMNIPHDSAIPLLGAHPT*MWAYVHQNPGTVMLTETLFMIATNWTLHKCPQ**KE*CNGAVTEWSAALKQNKLQLHVTPRV
517	8568	A	1480	218	1677	SEIIFCKGVSSIWSFFFLPPSFLTLKTNSVPSWVMFK\KIKSFEV\VFNDPGKGVTAVGEKVA\GRVNSGRCVEVTRV\KAVRIP\ACRSGLKCLWMPGIPSRCKQTS\EYPRYEDTVFL\EDQPTGEN\EMVIMRPGNQYEYKFGFELP\QGPLEHSFKGKYGCVDY\WVK\AFLDRPSQPTQETKKNFEVVDLVDVNTP\DLMAPVS/ALKKEKKVSCMVIPDG\RVSVSARIDRKGFCEGDEISIHADFENTCSRIVVPKAAIVARHTYLANGQTKVLTQKLSSVRGNHIISGTCASWRGKSLRVQKIRPSILG\CNILRVEYSLLIYVSVPG\SKKVILDLPL/V*LGSRSGLSSRTS\SMGSRTS/SLRMSWVDLNIP\DTPEVPS\CILGCSFPEGSTVWESPTTP\LLDDMDGSQNSP\IFMYAPEFKFMP\PRTYTEVDP\CIFNHQCAVSMWKKRSSFTLLVSFWPSLPWTVHFFQRLNSLCNGSVGPTLSPLTS
518	8569	B	1481	21	410	MPSKVRCXSVQVFDAMKTATAVAHCKRGNGLIKLLEPVLLLGKERFAGVDTRVRVKGGGHVAQIYAIRQSISKALVAYYQKYVDEASKKEIKDILIQYDRTLLVADPRRCESKKFGGPGARARYQKSYR*

519	8570	A	1482	1	456	MPS/KGPLQSVQVFGRKKTATAVAH/CKRGNGLIKVNGRPLEM/IEPRTLQYKVLGSGTGVSGWRTLGDRDVVALESWGAGISNGMFRSCVGCRQWAAGASSASRQERFAGVDIRVRVKGGGPWPRFMSKKFGGPGARARYQKSTDKPIVTQNSLV
520	8571	A	1483	172	661	LLEPVLLLGKERFAGVDIRVRVKGGGHVAQIYGESQELGAWRRWLWEGGLHSAPVPFNCVSFSQLSVSPIS\KALVAYYQK\WSEHGSFP*GRWVCGDQVKDSV*LSKSSSLLFLPDVDEASKKEIKDILI\QYDRTLLVADPRRCESKKFGGPGARARYQKSYR
521	8572	A	1484	1	556	GAARVRLSSPRSDAMPSK/GVPLQSVQ\VFG\RKKDSGQLLAH\CKRA\NGLIQG*TGGPLEMIEARARLQYK\LLEP\VLLLGK\ERFAG\VDIPCPV*KGGWSTWPQIYAIRQS\ISQKPLVAYYPEM*VSMGPSHE/YVDEAFQRREIKDILHPSY\DRNPAGLAGPFVRCE\SKKF\GGPGA\RARYQKSYR
522	8573	C	1485	127	435	MAASXNPEVLDITEETLHSRFLEGVRNVASVCLQIGYPTXASVPHSIINGYKRVLALSVETDYTFPLAEKVKAFLADPSAFVAAAXLGCCHHSCSXCCCSPS*
523	8574	A	1486	1	689	KCFI/VGADNVASKQMQQIRMSFRGKAVC*WGKNTMMRKPIRGHLENNPALEKLLPHIRGNVGFVFTKEDLTEIRDMLLANKVPAAARAGAIAPCEVTVPAQNTGLGPEKTSFFQALGITTKISRGTIEILGVRNVASVCLQIGYPTVASVPHSIINGYKRVLALSVETDYTFPLAEKVKAFLADPSAF/VAAAP/VAAATTAAPRAAAAPAKVEAKEESEESDEDMGFGLFD
524	8575	A	1487	66	1104	RTAVMPREDRATWKSNYFLKIIQLLDDYPKCFIVGADNVGSKQMQQIRIVPWGEACVLMGQKTMNGPGPSEGHLENNPASEELLPH*\RGHLGFCFT\RED\LTEI\RDMLLAQ*GCQAAARCWCQLPPCEVTVPA\QNTGLG\PEKTSFFPGL*VSPTKNLPGGTH*KS*SYVQL\IKT\GDKMGSQTKAKAAEKMLKNLPPSPFGAGQPKQGV\RKNGKHPTNPESA*ISTRGKLCHSRF\LGGCPANVAKCLSCKIGYP\TVASSTPIPII\NGYKRVPGPCLWTPDYTFP\LAEKVKAFL\ADPSCLCVLLPPVG\AATTACFALLLQPPAKVEAKEESEESDEDMGFG\LFD
525	8576	B	1488	98	264	XQVVCKKYRGFTIPEAFRGVHRYLSNAYAREEFASTCPDDEEIELAYEQVAKALK*
526	8577	A	1489	155	1217	DPPSPVPAPPSSPRDGHFLVPDATMAEEQPQV\ELFVKAGSDGAKIGNCPFSQRLFMVLWLKGVTFNVTTVDTKRRTETVQKLCPGGQLPFLLYGTEVHP\DTTKIEEFLEAVL\CPPR\YPK\LAALNPEVQHSWGWDIFAKFFLPNIQEFQTPALN*QSGRRGFLESP*KVLDNYLT\SPPSPEEVDETSC*KIEGVSQ\RKF\LDGQRRPHPWLDLQTCCPKVTH*VQVV\CKRK*PGNSPHPPKAFPGKCHRVP*SKMPYAPGKNSPSHPVPDDEEIELRPMSKVAKALQISPSLGLPSTPSIFSTKAPGGFHIATPMGHTPKLASGQGILGDIEPAKGVVEEGMRERNGGPGSDF
527	8578	A	149	535	917	LVSPGKPPEQQGQLP*PRCQII*LVSPGKPPE/PTGTAPRSQPRLSVCPSTQDICRICHCEGDEESPLITPCRCTGTLRFVHQSCLHQWIKSSDTRCCELCKYDFIMETKLKPLRKWEKLQMTPRERRKIFCSVTFQRNRGSPVWFGLCMY
528	8579	A	1490	2	746	

529	8580	A	1491	217	1007	LNHNRLAVIMANLGCWMLVLFVATWSDLGLCKKRPKPGGWNTGGSRYPGQGSPGGNRYPPQGGGGWGQPHGGGWGQPHGGGWGQPHGGGWGQPHGGGWGQGGGTHSQWNKPSKPKTNMKHMAGAATAGAV*GGLCSYS\LGSAMSRPIIHFGSDYEDRYYRE\NMHRYPNQVYYRPMDEYSNQNNFVHDCVNITIKQHTVTTTTKGENFTETDVKMMERVVEQMCITQYERESQAYYQRGSSMGLFSSPPVILLISFLIFLIVG
530	8581	A	1492	32	487	SRRHGSSLWGKVNVEDAGGETLGRLLVVYPWTQRFFDSFGNLSSASAIMGNPKVKAHGKKVLTSLGDAIKHLDDLKGTFAQLSELHCDKLHVDPENFKLLGNVLVTVLAIHFGKEFTPEVQASW/QEDGDWSGQCPVLQIPLSSLPMMQSFQG
531	8582	A	1493	41	597	APSPRRPWVISQRRTKATI\TSLWGK\VNVE\DAGGET\LGRL\LVVYP\WT\QRFFD\SFG\NLSSASAIHGQPPKVQGTWSKKVLTFLGEMP*KHL\DDLKGHLLPKPEVNLHC\DKPAMWDP\ENFKAPGEMLLVTRFWAIPFSAKEFHPWRLAGLPGQKDG*LGVGQCPCSFQIPLKPLGP*IQ\SFQG
532	8583	A	1494	1	478	DTRFLERLRLSISSLVPDA\MGHFTEED\KATI\TSLWGK\VNVE\DAGGET\LGRL\LVVYPMDPRGFFDSFGNLSSASA\IHGQTPKVKATRAKKVLTSLGKMPIKHLGLIFKGTFCPSLS*TCTC*QACMWDP*GTFKLPGEMLLVTRFWAIPFSAKEFHP
533	8584	A	1495	3	370	SVCVRAHESVVKSEDFSLPAYMDRRDHPLPEVAHVKHLSASQKALKEKEKASWSSLSMDEKVELYRIKFKESFAEMNRGSNEWKTVVGGAMFFIGFTALVIMWQKHYGL\ASKWDYEKNEWKK
534	8585	A	1496	24	305	
535	8586	A	1497	197	745	LASEQFSTSVVCTSSMKVFVKSEDFSLPT\YMESAVTHPLAGRWPHVKAPCSAQPRRPLKEKEKALLGAAFSMG*GKFELLFALKFKEEALLED*TRGLRTELGKTGLFGPVPLFPSIGFSPRLVIHVGQKHYVLTAPFP\QSF*TKSWVGPSRTKRMLGQ*R*TPIQG\LASK\WDYEKNE\WKK
536	8587	C	1498	78	281	MELSNNHQLSMSLVELSMSLVWDANLLGWGKSCELTKPSWSLVRSTSRHSRKKGSSWHLPAKLCSTC*
537	8588	A	1499	302	687	
538	8589	C	15	354	416	MKESPGGELPQTGKKPVFLF*
539	8590	A	150	116	830	EGFPGRSLSGGLCCRLRRRFPIDGYRPWRRRRWSCCPSGVRPVRRMSHKSWIESTLTKRECVYIIPSSKDPYRCLPGCQICQQLVRCFCGRLVKQHAWFTASPAMKYLDVKLGDHFNQAIEEWSVEKHTEQSPTDAYGVINFQGGSHSYRAKYVRLSYDNQP\LVILQLTVKEWQMELPKLVISVHGGMQKFELHPRIKQLL*KGLIKAAVTTGALILTGGRNTGVGKHGGDAPQRTC

540	8591	A	1500	1	1622	MSKPKCLVILVGIQKSSQMPQFPPPAGSE RRRGIRQWEMGVVGGEMGVWWPPGVQ GSPPQAHRRLGSREQLFAPPLKEKSHIPP WGYSRENYPIPEPGPNGRPVTEVWGSPG PTVQWGWEGLHEALSPALINQAQKDPE VRLGAMVRVSVDTHPPPLTPRQSGPLSA LEELGVSFPTLSYLTPEPQLLGEHQIKGSF PGRSTALLLKEVLLRMHSVGICGSDVH\ YWEYLS/RFGNFIVKKPMVLGHEASGTV RKSGIIGKSTLKPG\DRVAIEPGCSPEEN* WNSCQDG/RRYNLSPSIFFCATPPDDGNL CRFYKHNAAFCYKLPDNVTFEEGALIEP LSVGIHACRRGGVTLG\NKVLVCGSWAN RGWVTLLVAKAMGAAQVVVTDLSATR LSKAKEIGADLVLQISKESPQEIARKVEG LLGCKPEVTIECTGAEASIQAGIYATRSG GTLVLVGLGSEMTTVPLL\HAAIREVDIK GVFRYCNTW\PVAISMLASKSV/DMSKPL VTHRVSSWRKVLEAFETFKKGLGLKIML KCDPSDQNL
541	8592	A	1501	1	804	
542	8593	A	1502	178	1093	TFLLPACLLAALLPLRHHVRGRAWVQG SILNEGVG*ALKD\LINE\ACWGY*APAG VNLQSMGHRPTVSL\VQLTLRV*GASTP YRC\DRNLGHGR*NLTS\MSKILKMAAG NED/ISLTLRAEDNAGYLGR*YFEGTKPG RKFSDYEMKLMDLDVEQLGIPEQE\YSC VVKMPSGEYA\RICRESQPILGDAVV\ISC A\KDGSENFSASGELGNET\IKLSQTSNVD KEEEA\VPIKMNEP\VQPNFCH*GYLNFFT K\ATPLSSTVDTPVCSADGTPLVGRSIKIA GYGDHLKYLLGLPKDPRIEEGSLGHS
543	8594	A	1503	32	487	SRRHGSSLWGKVNVEDAGGETLGRLLV VYPWTQRFFDSFGNLSSASAIMGNPKVK AHGKKVLTSLGDAIKHLDDLKGTFAQLS ELHCDKLHVDPENFKLLGNVLVTVLAIH FGKEFTPEVQASW/QEDGDWSGQCPVLQ IPLSSLPMMQSFQG
544	8595	A	1504	1	591	NFALEAKNSARAISSLVPDAHGVISQRRT KATI\TSLWGK\VNVE\DAGGET\LGRLLV VYPWTQRFFDQLLANLSSASAHHGQPPK VQGHMAKKVLTFLGEMPIKHLDDLKGH LLPKPEVNCTVDKPAMWDPENFKAPGE MLLVT/LFWAIPFSGKEFTP*RLQASWAE RWVTWS\GQCPCSFQIPLKPLGP*IQ\SFQ G
545	8596	A	1505	49	273	
546	8597	A	1506	81	720	LFKAPEPHVEEDD\DDELDSKLNYKPPPQ KSLKELQEMDKDDESLIKYKKT\LLGDG PVVTDP\KAPNV\VVTRLTL\VCESAPG\PI TMDLTWKIWKALKKGNHLVLKGRFWNI RSSKFHFPKLNRG*LLFRA*NYVQHTYR TG\VKVDKATF\MV\GSYGPRPEEYEF/LS LPVEEASQRAWLARRHVTTKSPFFTDDD KQDHLSW\EWNL\SIKKEWTE
547	8598	A	1507	5	290	FNLTHIESRPSRLKK/DEYE/FFTHLDKRS LPALTNIIKILRHDIGATVHELSRDKKKD TVPWFPRTIQELDRFANQILSYGAELDAD HPVSPWPVG
548	8599	A	1508	68	312	
549	8600	A	1509	317	916	TSSPPSSLCFLSFSDICHELLGHVPLFSDR SFAQFSQEIGLASLGAPDEYIEKLATIYW FTVEFGLCKQGDSIKAYGAGLLSSFGEL QYCLSEKPKLLPLELEKTGIQNYTVTEFQ PLYYVAESINDAKEKVGNSAATIPRPFSV RYDPYTQRIEGLDNTQQAHDLG*FHLTV EIGILCSALQKNKVKAMDRMVVCQAVE
550	8601	A	151	770	950	CHSEHRNYKNNHHSIIKVRPRWRIHFHS NVIS*SLVHISKVFVAYKCNQYFHIRKFR

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551	8602	A	1510	389	1881	NLQPHVLFANLPVPEALKSQRPHSRGASMSTAVLENPGLGRKLSDFGQ\ETSYI\EDNCNQKWVPISLDPPHLKERKLGALGPKYCALF\EENDVNLT\HIES\RPSRLK\KDEYGFFPPFGIKRSLP\ALTNIIKILRHDIGATVHELSRDKKKDTVPW\FPRTIQ\ELDRFANQILSYGSGNWDA\DHPGFKDPVYRARRKQFADIAYNYRHGQPIPRVEYMEEEKKTWGTVFKTLKSLYKTHACYEYNHIFP\LLEKYCASHEDNIPQL\EDVSQFL\QTCTGFRLRPVAGLLSSRDFLGDLAFRVFHCTQYIRHGSKPMYTPEPDICHELLGHVPLFSDRSFAQFSQEIGLASLGAPDESIEKLAPIYWFTVEFGLCKQGDSIKAYGAGLLSSFGEFQYCLSEKPKLLPL/ESLEKTAIQNYTVTEFQP\LYYLAE\SFNDAQGEI*GTFAATI\PRPFSV\RHDPHTPQRIGGSWDNTQQL\KILA\DSI*Q*IGIPFAVALQNIK
552	8603	A	1511	1	191	MQK*ITAWAPAPMKIKIIASPERKYSVWIGGSIWPQLST/FQQMWISKQEYDESGPSIVHRKCF
553	8604	A	1512	1	360	SGACPAFLVDRNLRHHETTFNLIMKCDVDIRKDLYANTVLSGG\TTMYPGIADRMQKEITAL/APPSTLRFRFIAPP/ERRKYSVWIGG\SILASLSTFQQ\MCLGKQEYDESGPSI\VQRKCF
554	8605	A	1513	13	1277	INPPPLSRRCQLSHSVLPPLRRRVSLPVAMEEEIAALVIDNGSGMCKAGFAGDDAPRAVFPSIVGRPRHQGVMVGHGPRTDSYVGDEA/QRSKRGILTLKYPIEHGIVTNWDDME\KIWHHTFYNELRV\APEKHPVL\LTEAPLNPKANREKMTQ/ILCFETFNTPGHVPWPIQAVLSL*SLWAQPIGIVMDSG\DGVTHTV\PILRGATTLLHAI\LRLGPGLARDLTDYLMKILT\ERGYSFTTHGPSGKTFRNIKGEACATSPLDFEQ\EMGT\AASSSSLEKSYELPDGQVITIGNERFRCPEALFQPSFLGMESCGIHETTFNSIMKCDVDIRKDLYANT\ALSGGTTMDPG\IADKIAEGRSTALAAPAP*KIR\IIAPP\ERK\YSVWIGGSILASLSTFPARFWI\SKQE\YDESGPSI\VHRKCF
555	8606	B	1514	93	366	XTSVVRPFAKLVRPPVQVYGIEGRYATALYSVLNPYVKRSIKVKSLNDITAKERFSPLTTNLINLLAENGRLSNTQGVVSAFSTMMSVHRGE*
556	8607	A	1515	1	785	FRRQRARAPLRVFLFPLGFDLQPPGRRWAAPAV\SGLS\RKVRCFSTSVV\RHFAKLVGPS\VQVYGIEGRYAT\ALYSAASKQNKLE\QLEKELLRVAQNPEGNPKVAAS\VLNP\YVKR\SIKSEKALN\DITSKKRRFSPPSTTQPWIKFALPE\NGSD*SKYPQGSPFPALFPTHDEVSHPR\GGYPCTVDLWHLLLEGSQTPPGI*KLSLKSLP*VKGQVLKLEAKTDPSI\LGGMIVRIGE\KYVDMSVKTKIQKLG\RAMREIV
557	8608	A	1516	1	2199	

558	8609	A	1517	9	1618	PALCPTLSSGTSARFRGKNQFSGGLPQITLSPLAQPCGRLAAMYSNVIGTVTSGKRKVYLLSLLLDSFGDCVTCHG\SPVDICTAKPRDIPMNPM\CIYRSPEKKATEDEGS\EQKIPEATNNR\RVW\ELSKAN\SRFCLPLSYSAPGQNSKD*H*LTFFCSPLSIFQGFLLWTKV\GACNDTLQQLMEVFKF\DTIS\EKTF*SRSHFFFA\KLN\CRL\YRKANKSSKLVSANRLFGDKSLTFNETYQ\DISELVYGAKLRPL\DFK\ENAEQ\SR\AAINKW\VSNKTEGRIHRCSFPSGRPFNELTVLGGGFNTIYFQGACWK\SKFSPENTRKELFYKADG\ESC\SASMDVTREGKFRYSGAWLEGT/QVLVVCPFKGDDIT\MVLILPKP*EGAWAKVEK\ELTPEVLAKSGWD*FWREMMLVVHMPRF\RI\EDGLQV*REQL\QRHGPLSDLFSP*KSPKL/LPGIVAEGRDDLYVSDAF\HKAFLEVNEEGSEAAASTA\VVIAGRSLNPNRVTFQGQQLFPGFLLREVPL\NTIYLHGAELANPCV
559	8610	A	1518	2	363	ELDTLCDLYEP*PSPSIIFINTRRK/VDWLTEKMHARDFTVSAMHGDMDQKERDVIMREFRSGSSRVLITTDL\RIGRGGRFGRKGVAINMVTEEDKRTLRDIETFYNTSIEEMPLNVADLI
560	8611	A	1519	201	648	GPCGHGRVFPLPSLAAHMDA*GLLLRDRVSSVHMLKRLSFLT*ARGIDVQQVSLVINYDLPTNRENYIHR*A*IWNTPLPLHTWPSLGLKLLIFLIPFLVFQ\IGRGGRFGRKGVAINMVTEEDKRTLRDIETFYNTSIEEMPLNVADLI
561	8612	A	152	1	253	SKLAAEMTANRLAESLLALSQQEELADFPKDYLLSQSQD\EGDNDGERKHHKLLEAISSLDGKNRRKLAEMSDVILMM*EFVVA
562	8613	A	1520	49	1720	GSTISSASQDSRSRDNGLDGIEPEGVIESNWNEIVDSFDDMNLSESLLRGIYAYGFEKPSAIQQRAILPCIKGETSQSQKTLWTVPDLGRVASGW*CPSHISQGQSNLLVHPSLAFDPCPCLVHALDT*VSFKEVVL*PAYICIYSHVSSPAWCAILDELITGPCF*SGSHCVTVLIGKVVCEP*NAWFIGCLLTSLT*DLNIPKGMLFTTFNS*FICLGYDVIAQAQSGTGKTATFAISILQQIQ\KVVMALG\DYMG\AS\CHACIRGAPTCVAEVQKL\QMEAPHIHRGVPPGRVF*YALPEDTLSPKYI\KMFVLDEA\DEM\LSRGFKGQIYGHIQKAQAAPPRVVLLSATMPFD\VLEVTKKFMRGPPFRILVQKGELT\LEGIRQ\FYI\NVEPEE\FNLDTLCDLYENLDHHPRPVIFHQPPGGKVDWPHPRRMHAADF/TLYSAMHWRFWTQKERRT*L*REF\RSWLLARIFDTQLDLLGQRALMCQQV\SLVIQTYDPFPPTRGKLLIHR\IGSRVDRFGRKGVPINMLTE/EKTKRNLEDIETF\YNTSIE\EMPLNVA
563	8614	A	1521	3	607	FCPRGQEFGEGNKLLSPRRPWVISQRRTKATI\TSLWGK\VKCGKNAGKEETPGKGSLVVL/HPWTPRGSFEQLWQTCPSALCPSMGNPQSQGTMAKKVLTSLGRCP*STLD\DLKGHLLPKPEVNLHLLTSLHVGS*RTFKLPGEMLLVT/LFWAIPFSAKEFHPLKVAGFPGQKDG*LGVGQCPCSFQIPLKPLGP*IQ\SFQG
564	8615	A	1522	23	437	KTPGKGSLVVL/HPWT\QRFFDSFG\NLS\SASAHHGQPPKSKAHGKKVLTSLGDA\IKH\LDDLKGTFAQLSELHCDKLHVDPENFKLLGNVLVTVLAIHFGKEFTPEVQASWQKMVTCSGQCPVLQIPLSLLPMIQSFQG

565	8616	A	1523	23	249	APSPDAMGHFTEEDKATITSLWGKVNVEDAGGETLGRLLVVYPWTQRFFDSFGNLSSASAIMGNPKVKAHGKKVLTSLGDAIKHL\DDLKGTFAQLE*TCPLPLPSWATPKSRHMARRC
566	8617	A	1524	46	379	SQTPMGHFTEED\KATI\TSLWGKGEMWKKCWKEKTPGKGSLVVL/HPWTPRGSF\DSFGKPVPLPSAHPWATPKVKAPWPRRCLTSLGEMPIK\HLGLIFKGTFCPSLK*TCTC
567	8618	A	1525	21	457	NPRVRGALTMELSESVQKGFQMLADPRSFDSNAFTLLLRAAFQSLLDAQADEAVL\DNKNSLEILLGSIGRSLPHITDVSWRLEYQIKTNQLHRMYRPAYLVTLSVQNTDSPSYPEISSSCSMEQLQDLGGKLKDASKSLGKSTQL
568	8619	A	1526	1	455	
569	8620	A	1527	3	468	
570	8621	A	1528	50	895	THASDGALTMELSESVQKGFQMLADPRSFDSNAFTLLLRAAFQSLLDAQAD\EAVLDHP\DLKHIDP\VVLKHC\HAAA\ATYILEAGKHRA\DKSTL\STYL\EDCKILTEKRIELFFAREYQ\NNK\NSLEI\LLGKY*GRSLPSYNRVFSWALWIIQVKDQSTFHRM\YRP\AYLGDLKVVQNTGIPPS\YPRELVFSCQPWNQL\QDL\VGETLKDASKKPWKRATSVVTLGKVNRSPPSSRRKTQKPPLPFSWNHRLCRAGCPFSVEKNFSLLNLYPFIHFGHFKNV
571	8622	A	1529	1404	1586	ENESRFSDRNQASAGLGYLSDSL*QWIVGNGHATDLWQNCSTSSSGNVHHCFSSSPNGSG
572	8623	A	153	1	759	
573	8624	A	1530	187	701	AELAARMLLLLLSIIVLHVAALVLLFVSTIVSQWIVGNGHATDLWQNCSTSSSGN\VHHCFSSSPNEW\LQSCSRGTMDPVDSSFSILSLFLFFCQLFTLTKGG\RFYITGIFQILAGLCV\MSAAAIYTVRHPEW\NLNSGY\S*RFA*I\LAWVAFPL\ALLSGVIYVILRKRE
574	8625	A	1531	1	485	
575	8626	A	1532	2	459	
576	8627	B	1533	1	2784	MAAMAVGGAGGSRVSSGRDLNCVPEIADTLGAVAKQGFDFLCMPVFHPRFKREFIQEPAKNRPGPQTRSDLLLSGRALEIGADLPSNHVIDRWLGEPIKAAILPTSIFLTNKKGFPVLSKMHQRLIFRLLKLEVQFIITGTNHHSEKEFCSYLQYLEYLSQNRPPPNAYELFAKGYEDYLQSPLQPLMDNLESQTYEVFEKDPIKYSQYQQAIYKCLLDRVPEEEKDTNVQVLMVLGAGRGPLVNASLRAAKQAD
577	8628	A	1534	2	607	
578	8629	A	1535	1	207	
579	8630	A	1536	232	755	LSCCADDGVSIPGEYTSFLAP\IFSPKLYNKVRACRKKARDLKAQFEMPIVVRLHNSNQLSAPQPCSTFSHPNRDPMIDNN\RYCTLEFPVEVNT\VLQCFAGYFETVLYQDITLSIRPETHSPGMFSWFPILFPIKQPITVREGQTICVRFWRCSNSKKGSSHQSMKTSGQGVRN

580	8631	A	1537	35	2271	LCDWLLVSRNPGVDSARRKMAAMAVG GAGGSRVSSGRDLNCVPEIADTLGAVAK QGFDFLCMPVFHPRFKREFIQEPAKNRP GPQTRSDLLLSGRDW\NTLIVGK\LSPWD FVPD\SKV\EKIRRNSEGGPCLQELNFG\A YLGLPAFLLPLNQEDNTNLARVLTN\QIH TGHDFYMFWR\RIHLKKPEDL\RDDIIEN APTTHTEEYSGEEKTWMWWHNFRTLCD YSKRIAVALEIGADLPSNHVID\RWLGEPI \KAAILPTSIFLTNKKGFPVLSKMHQRLIF RLLKLEVQFIITGTNHHSEKEFCSYLQYL EYLSQN\RPPPNAYELFAKGYEDYLQSPL QPLMDNLESQTYEVFEKDPIKYSQYQQA IYKCLLDRVPEEEKDTNVQVLMVLGAG RGPLVNASLRAAKQADRGIKLYAVEKN PNAVVTLENWQFEEWG\SQV\TVVSSDM REWVAPEKADIIVS\ELLGLIC*PIELSP*V PWIGAQHFP*KMIGVKHPPGSYTSFLAPI SSSKLYNEVRACREKDRDPEAQFEMPYV VRLHNFRQLSAPQPCFTFS\HRNRD\PM\I DNNRY\CTLG\FPVEVNTVLHGFAGYFET VLYQDITLSIRPETHSPGMFSW\FPIPLPY* GSPLTVRERAKPFCV\RFW\RCRQFPRKV WVWSGGC*QAPVCSCLIQKPPKGPPQYT HWPLLSPCRAPSVPEALGKPAFRFLPPCS NSKVPVTSYGAVIPPWPIQRREHFQSCFP CPYIQGGPRDYN
581	8632	A	1538	137	303	
582	8633	A	1539	122	385	YPALEHILKAQAIQSRCGCDSCLPPSAPW DHPGPTTP\SPGRRAAADPWHLSPIDGRE HLR*VPVLPVTPPSPTLGHWVTDPSPGV GG
583	8634	A	154	1	921	
584	8635	B	1540	277	480	GTGHFYGRTPSDTNCQEQYTHRKLCQIK SKADLVLMKNSKSLTRVIRNILAPQDQN HQQNPLNSQFLQ*
585	8636	A	1541	32	1386	VLLGPKAERTNSRRNYQRRDYFSAPRSI TSNQSAKSSSSRGVYSAYQAPDIHECCH FRSASFFLDKMATPAVPVSAPPATPTPVP AAVPASAPASVPAPTPAPAAAPVPAAAP ASSSDPAAASATTAAPGQTP\ASAQAPA QTPAPALPGPALPGPFPGGRVV\RLHP\VI LASIVD\SYERRNEGACPS*SGTLFGKLV DK\HSVE\VTN\CFSVPHNESEDEV\AVDM EFAK\NMYETGIKKVS\PNKLILG\WYAT GHDITEHSVL\IHEYYSREAPNPIHLTV\D TSLPGTGRMSIKA\YVST\LMGIPLGRT/L WGVMFTPLTV\KY\AYYDTERIRRLTLIM K\TCF*PPTRVIWTSQVDLQQEGGGIQLR NPGMPLSTSVANMPEGCTCLGKVSADN TIRKVGHFLMSL\VN\QVPENRKPMTFET MLNSNINDLF\MVTYLANLTQSR\IALNE ELVNL
586	8637	A	1542	1	3399	
587	8638	A	1543	1	3126	
588	8639	A	1544	115	348	
589	8640	A	1545	1	513	FHFTPLFRDGETYVV/MLDSTLPRSQYAY ILPQVSFTAVGYHKHITLIFNPARKLPEQ DIAQGSYIALPLTLLVLLAGYNHDKLIPL LLQLTSRLQGVGALGQAASDNSGPEDA KRQAKKQKTRRTLRLQEEFQLMWCLVP WRGTLGIHLFSSLPFASEILLETTATCIHY
590	8641	A	1546	1	888	
591	8642	A	1547	1	4710	

592	8643	A	1548	37	3683	LGLGLSMLVGQGAGPLGPAVVTAAVVLLLSGVGPAHGSEDIVVGCGGFVKSDVEINYSLIEIKLYTKHGTLKYQTDCAPNNGYFMIPLYDKGDFILKIEPPLGWSFEPTTVELHVDGVSDICTKGGDINFVFTGFSVNGKVLSKGQPLGPAGVQVSLRNTGTEAKIQATATQ\PGGKFAFFKVLPGDYEILATHPTWALKEASTTVSVTNSNANAASPLIVAGYNVSGSVRSDGEPMKGVKFLLFSSLVTKED\A
593	8644	A	1549	1	474	
594	8645	A	155	1	424	
595	8646	A	1550	1	1554	
596	8647	A	1551	87	736	FIMDNLSSEEIQQRAHQITDESLESTRRI\LGLAIESQDAGIKTITMLDEQKEQ\LNRI\EEAWAQIIKDMR\ETEKTLTELNK\CCGLCVCPCNRTKELLSLGQGFIKTTWGRWWEKTSPWQC*YSKQPGP/VWTNGQLQQPTTGAASGGYIKRITNDAREDEMEENLTQVGSILGNLKDMALNIGNEIDAQNPQIKRITDKADTNRRFVLDYCPMPEQK
597	8648	A	1552	99	362	
598	8649	A	1553	184	360	
599	8650	A	1554	3	403	
600	8651	A	1555	1	872	EFGTRWDFSMAVFADLDLRAGSDLKALRGLVET\AAHLGYSVVAINHIVDFKEKKQEIEKPVAVSELFTTLPIVQGKSRPIKILTRLQIMLSDH\SPAKVLKNTLKRGAGL*D\VGAGFPKAEKAFFILLCTHL\DVDL\VCITVTEKLPFYFKRPPINVAIDRGLAFDLALIPLLSKDSTMRRYTISPVPLQF*CKSCKGKNVIIS\SACKKRPF*KIRGPILTWAN\LGLPVWGFSESERQGFGCPPNCRAA\LLHGETRKTAFGIISTVKKPRPSEGDEDCLPASKKAKCEG
601	8652	A	1556	46	584	SRRPWVISQRRTRLLSTSLWCKVNVE\DAGGETLGRLLVVYPWTQRF\FDSFGNLSSASAIHGQTPKVKAHGKKVLTFLGEMPLKHL\DDLQGAPFAQA*SELALVDKPAMWDP*GTSKLPGEILLVTRFGQSLFRQKNFTPGGARVSWGRKMGDLELASALVPSRLPLSSLAHECRAFQG
602	8653	A	1557	1476	1747	GNFNSLRLSKTQLCAHCLYPHTFGRQRWVDHLRLGVRD*PGQHGETPSLLKNNNNNTKISWAWWHEPV\IPA\MGEAEAGESLEP\GRRRLQ
603	8654	A	1558	1	507	
604	8655	B	1559	15	400	MSMLRLQKRLASSVLRCGKKKVWLDPNETNEIANANSRQQIRKLIKDGLIIRKPVTVHSRARCRKNTLARRKVRHMGIGKRKGTANARMPEKVTWMRRMEILRHLLTRYRECETINRAMHHLLNLKVMS*
605	8656	A	156	3	1371	INIVVIGHVDSGKSTTTGHLIYKCGGIDKRTIEKFEKEAAEMGKGSFKYAWVLDKLKAERERGITIDISLWKFETSKYYVTIIDAPGHRDFIKNMITGTSQADCAVLIVAAGVGEFEAG\ISKNGQTR\EHALLAYTLGVKQLIVGVTKMDSTEPPYSQKRYEEIVKEVSTYIKKIGYNPDTVAFVPISGWNGDNMLEPSANMPWFKGWKVTRKDGNASGTTLLEALDCILPPTRPTDKPLGLPLQDVYKIGGIGTVPVGRVETGVLKPGMVVTFGPVNVTTEVKSVEMHHEALGEALPGDNVGFNVKNVSVKDVRRGNVAGDSKNDPPMEAAGFPAQVIILNHPGQISAGYAPVLDCHTAHIACKFAELKEKIDRRSGKKLEDGPKFLKSGDAAIVDMVPGKPMCVESFSDYPPLGCFAVRDMRQTVAVGVIKAVDKKAAGAGKVTK

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606	8657	A	1560	15	710	INPPPPAFLSLLRPQPCSMLRLQK\RLAS\SVLR\CGKKKVWLDPNETNEIANANSRQQI\RKLIKDG\LIIRKPV*RVHSRARCRKNTL\ARRKGTAH/CGIGKREGYSPMPRMP/TRKVTWMKENEGFWRRLASERYR*NLKKIRFATLLSQALYPEG*RGNVVSKTRRVFHGNTFHKLEGRQRPRKKAPWLDQA*G/RRRS*DQGKHGKR\REERLPGQRKEEINQRLYSKEEETKK
607	8658	A	1562	2	419	MASGRARCTSNLRNWVVEQVESGQFPGVCWDDTAKTMFRIPWKHAG\WAIFKGKYKEGDTGGPAVWKTRLRCALNKSSEFKEVPERGRMDVAEPYKVYQLLPPGIVSGQPGTQKVPSKRQHSSVFSERKEEEDAIANCTL
608	8659	A	1563	20	431	
609	8660	A	1564	107	400	
610	8661	A	1565	191	353	PHSSTTCPPAPMLVF*KRDPPSLGPHDALVPPCPVPVEILRSSAKTRCGKKASS
611	8662	A	1566	553	690	SRRRFPMGSGTKLV*G*GEMESLEEQAKGKGTESCALHPVDLFSSPGPLFNSLCLSKPMAPPTL
612	8663	A	1567	2406	4031	GGRAGDGPLSATCTYAPSLWLDEGSPCLPGPLVTEADRRGTLGTEYPPQAEVAEGKGPDEGPMACSLRNSSSTNKEASYHPGFLVVLLPEFDWYLKSPNMYQVGTVGECRCTGVHSSPEVPGLTPGNWPPWGSHGVTQRMASG\RARCTRKLRNWVVEQVESGQFPGVCWDDTAKTMFRIPWKHAGKQDFREDQDAAFFKAWAIFKGKYKEGDTGGPAVWKT\SLCCALNKSFDFKEVPERGRMDVAEPYKVYQLLPPGIL\SGH\PGTQKVPSKRQHSSVSSE\RKE\EKDAMQNCTLSPSVLQ\DSLNNEE\EGGSGGAVH\SDI\GSSSSSSSPETTRKITDTTE\APFQGDQ\RSLEFL\LPPEPD*SLLLTFI\YNGRVVGEAQVQSLDCRLVAEPSGSESSMEQVLFPKPGPLEPTQRLLSQ\LRRGILVASTPQGLFRCSAFCPIPIFWGIAPQ\APPG\PGPHLLPSNECVELFRTAYFCRDLVRYFQGLGPPPKF\QVTLNFWEESHGSSHTPQNLITVKMEQAFARYLLEQTPEQQAAILSLV
613	8664	C	1568	77	325	MSLIQEALHLVLTDPDAPAGDDPKYREWHHFLVVNMKGNDISNGTVLSDYXCAAPPKAPSHVPQFSVACIIDFSSSCPPWHG*
614	8665	A	1569	60	287	
615	8666	A	157	1	92	TSHQSHCSTFLTVSKW**LKTAYCLYHYHS

616	8667	A	1570	3	703	VEFFSSQRAELYATPLTPAPGPNGGIPGWTLWLALPRPGNLRKGPGPLSLQEVDEQPQHPLHVTYAGAAV/DDELGKVLTPTQVKNRPT\SISWDGLD/SKGKLYTLVLT\DPDAPKQGKDP\KYRE\WHHFLGWSTLKGQMTSATGTVLS\DYVGLGGLPKGTGLHR\YVWLV\YEQ\DRPLK\CDEPHPSATRS\GDHRGKIQRWASLPVKK**SSRAPGGWAPCYPQPEVGMNQCAPKL
617	8668	A	1571	1749	2411	APSCLVSEHSAPGPQRELPQPLLTFQAYEQILGITC\GSCP\AQGWGAWSSDAVPQLLARRPPLPHGLPACGEWGRGELGVKPSGLPSHAGPAWGHQVRTVCATAHPQDCISPEGAVEEEIVGG*GC\TEGQSQRVLQIWP\SQGVSSLSALVPLN\MF\TELLIEYYEKIFSTP\EAPGEHGLAPWEQGSRAAPLQEAVPRTQATGLTKPTLPPSPLMAARRRL
618	8669	A	1575	1	254	
619	8670	A	1576	3	308	
620	8671	A	1577	1	380	IPTPLIGNFGPRGPRIRHERPQKRDDRREPSSFGKRRQ*DGTLLC\RRCGS\KA\YHLQKSTCGKCGYPAKRKRKYNWSAKAKRRNTTGTGRMRHLKIV\YRRFRAWDFREGTTPKPK*GSLLQHSSSS
621	8672	A	1578	41	544	APSPRRPWGHFTEED\KATI\TSLWGK\VNVE\DAGGE\TPGKGSLVVYP\WTQRFFDSFGNLSSAF\AHHGQTPKVKAHGK\KVLT\SLGDAIK\HLDDLKGTFAQA*VNLHL*QSCNVDP\ENFQAPGEMLLVTR/VLAIHF\GK\EFTPGGCKASWAEDG*LAVGQWPCSSRYH
622	8673	A	1579	1207	1369	
623	8674	A	158	232	552	SLH*PRMATQRKHLVKDFNPYITCYICKGYLIKPTTVTECLHTFCKTCIVQHFEDSNDCPRCGNQVHETNPLEMLRLDNTLEEIIFKLVPGLREQELERESEFWKENKPQGNGQDDTFKSLTNRK
624	8675	A	1580	1	1716	TCIAAVKMEGPLSVFGDRSTGETIRSQNVMAAASIANIVKSSLGPVGLDKMLVDDIGDVTITNDGATILKLLEVEHPAAKVLCELADLQDKEVGDGTTSVVIIAAELLKNADELVKQKIHPTSVISGYRLACKEAVRYINENLIVNTDELGRDCLINAAKTSMSSKIIGINGDFFANMVVDAVLAIKYTDIRGQPRYPVNSVNILKAHGRSQMESMLISGYALNCVVGSQGMPKRIVNAKIACLDFSLQKTKMKLGVQVVITDPEKLDQIRQRESDITKERIQKILATGANVILTTGGIDDMCLKYFVEAGAMAVRRVLKRDLKRIAKASGATILSTLANVEG*ERFEGAMWDQAEEVVQERICDDELILIKSTKA\RTSASIISRVPIDSMCDEMERSL\HDALC\VVK\RVLESK\SVVPR\GGAVEAALSIY\LENYA\TSMGSREQLAIA\EFARSLSGYSPIPLAVNAAQDSTDLVGKN*R/RLFHNEAPGLTPE\RKN\LKWIGLDLSNGKP\RDNKQAGVFEP/TPIVKVKSLKFATEAAIT\ILRIDDLIKLHPRK*R*\KHGSYEDAVHSGALND
625	8676	A	1581	1	513	PRVRNLSREWLCDRHLREKMFSSVAH\LARANPFDTPH\LQLVHDGLGDLRSSSPGPTGQPRRPRNLAAAAVEEQYSCDYGSGRFFILCGLGGIISCGTTHT\ALVPLD\LVKCRMKV\DPQKYKGIFNG\FSVTLKEDGVRGLAKGWAPTFL\GYSMQGLLQVLAFYEVFKVLY

626	8677	A	1582	2	1296	ALCEPQPFQGSGCVIAILGRKMFSSVAHLARANPFNTPHLQLVHDGLGDLRSSSPGPTGKPRRPSQ/HMAAAPVEEQYSCDYGSGRFFILCGLGGIISCGTTHTALVPLDLVK\CRMQVDPQKYKG\IFNGFSVTLKEDGV\RGLAKGWAPTFLGYSMQGLCKFGFYEVFKSL\YSNMLGE\ENTYL*RTSLYLAASAS\AEFFADIALAPMEAAKVRIQTQP\GYANT*EGISFPKCIKEEGLTSILQGGLLPLWMRQIPYTMN*SSPCLERTV\EA\LYKFV\VPK\PRRE*FKRQSRLVVTIW*QVTIARVFCANCFSPLPEFLG*PVLD*GKKVSQCFLWVLQRDLGFK\GV\WKGLFA\RII\MIGT\LT\ALQWFIYYSVKGYFR\LPRP\PPP\EMQES\LKKKLGVNSVVRIKANCGLNLLVDPVFEESAKGTFIYLTV
627	8678	A	1583	127	433	RPLESWIGLVRCNICRSPIAEAVFRKLVTDQNISKNWRVDSAATSGYEIGNPPDYRGQSCMKRHGIPMSHVARQ\DLNRKSNRVKTCKAKIELLGSYDPQKQL
628	8679	A	1584	2	535	
629	8680	A	1585	551	1299	PADPPRPSYYRHRTPPQAHWSRLRRSRLRRRGSHTRCPVGVGAGLRRRAGARLAVRLRASACGTPRCLGASARGKMAEQATKSVLFVCLGNICRSPIAEAVFRKLVTDQNISKN/WEGRQRGNFRWVIDSGAVSDWNVGRSPDPRAV\SCLRNHGIHTAHKARQIT\KEVFPTFDYILCMDESNL\RDLNRKSN\RVKTCKS*KFELPWEL*SPQKQLIIED\PYYGE*LWTLETVYQQ\CVR\CCRAFL\EKAH
630	8681	A	1586	1	1239	
631	8682	A	1587	298	408	
632	8683	C	1588	92	244	MRCEIILVLIPYVYFYSNKLLCSRLXXXXXGGAVLKNPWGGQSLPGLAR**
633	8684	A	1589	33	191	RDDPRVRPPPNSHT*PQQEPGL*LIKCTSPPQAPAPRTVHGPYFYMRLIKMF
634	8685	A	159	445	673	RECLH*PRMATQRKHLVIDFNAYITCYICKGYLIKPTTVT\ECLHT/FCRCMEAFPSLLLA
635	8686	A	1590	3	1285	
636	8687	A	1591	3	3469	QPGHTIYLLPTVVICNLLPCELDFYVKGMPINGTLKPGKEAALHTADTSQNIELGVSLENFPLCKELLIPPGTQNYMVRMRLYDVNRRQLNLTIRIVCRAEGSLKIFISAPYWLINKTGLPLIFRQDNAKTDAAGQFEEHELARSLSPLLFCYADKEQPNLCTMRIGRGIHPEGMPGWCQGFSLDGGSGVRALKVIQQGNRPGLIYNIGIDVKKGRGRYIDTCMVIFAPRYLLDNKSSHKLAFAQREFARGQGTA
637	8688	C	1592	398	655	MMFPLAFSLPLKNAFHISVCRVCPGYTGFAKRALTALNLDTSLSANCCNTPPAEXPNVHNPCYMGLSKPARXSKLGSMCKGSSXH*
638	8689	A	1593	1	930	
639	8690	A	1594	1	134	

640	8691	A	1595	3	2455	HASVCPAVGVQRLCLFPCVSLQALFMGS PLRFDGRFF\LVTGAGAGLGRAYALAFA ERGALVVVNDLGGDFKGVGKGSLAADK VVEEIRRRGGKAVANYDSVEEGDKVVK TALDAFGRIDVVVNNAGILR/DINSFARIS DEDWDIIHRVH\LRGSFQVTPAAWEHMK KQKYGRSIMTSSASGIYGNFGQANYSAA KLGLLGLANSLAIEGRKSNIHWNTIAPNA GSRMTQTVMPEDLVEALKPKYVAPLVL WLCHQSCEENGGLFEVGAGRIGKLRWE RTLGAIVRQKNHPMTPEAVKANWKKIC DFENASKPQSIQESTGSIIEVLSKTDSEGG VSANYTSRATSTATSGFAGAIGQKLPPFS YAYTELEAIMYALGVGASIKDPKDLKFI YEGSSDFSCLPTFGVIIGQKSMMGGGLA EIPGLSINFAKVLHGEQYLELYKPLPRAG KLKCEAVVADVLDKGSGVVIIMDVYSY SEKELICHNQFSLFLVGSGGFGGKRTSDK VKVAVAIPNRPPDAVLTDTTSLNQAALY RLSGDWNPLHIDPNFASLAGFDK\PILHG\ LCTFGIFCQGVLLQQFCR*MDVVQGFKG N*RARF\AKPVYPGANFYQT*ECWKE\G NRNSFFKPKVQGNLETLVISKWHMWDL GTQHSGYFSLRTPSEGPGSFRVPLVFEE\I GRRLKDIG\PEVVK\KVNAVF\EWHITKG GNI\GAKWTIDLK\SGSWEKLYQGPS/KK GAADTTIH/ILSDEDF/LWEVVLGQA*PSR KAFFSGPG*RPQGGTSMA*AQ\KLSDGFL KDYAKLLKGTPTLLIKMESIKIPPPHPQIC LDYSAKS
641	8692	A	1596	2	289	
642	8693	A	1597	1	397	
643	8694	A	1598	1	410	STMISPVLILFSSFLCHVAIAGRTCPKPDD LPFSTVVPLKTFYEPGEEITYSCKPGYVS RGGM\RKFICPLTGLWPINTLKCTPRVCP FAGNLRKMGAVRLITDFLNYSPTRFSFSL LTWGFILEWALDS\AKCIEGG
644	8695	A	1599	19	1215	CQCDSSTMIFSRCSSLFSSFLCHVAIAGRT CPKPDDLPFSTVVPLKTFYEPG\EEITYSC KPGYVSRGGIEESLSCPL\TGTVGPFNTSG NVTPRVCPF\AGIFRKMGGRTLITTF*NYP NTDPVFSLLTLGF*FWNGALDFWPSCTG GKGKW\SP\ELPGLVAPII\CPP\PSIP/TGFA TLHVLLRPFRLGNNSPPIGDTAVFECLAH NMAMFG\NDTIT\CTTHGKLDLNYPECR GSKMPPFPHQDPDNGIW*TYPCQNPNTL FTRVKAPHLGLPHDGIFSGMGPRKEI\EC *PQTWGKPGSWPLAPSW*KPSLVKGTPV KKRPTVV/YPQGERVKDSREKFKEWECL HG**KFLSFCKNKEKKCSYTEDAQCIDG TIEVPKCFK\EHSSLAFWKT\DAS\DVKPC
645	8696	A	16	3	145	SSSSSDFAGQTL*STQTVQN*FKKVLKPG RLYPVPIATMGIKEPLIS
646	8697	A	160	22	849	WIERDLLNCIKRLK/PTTNNMLNDEIVNIS PKIIKIRQGYLLSMILFGIVQKDLTRKLM QGRETKGIEIRKEVKL*KRKRI*ISICRCH E*IW*VPCIKVMQKAFYDIPAKNMENEIL KKQCHFKDPSSA*REKMRLICFEELYPEN KITKEERDRI/RRTISKLLLFPKFHLQP*NP RQVSLMLN*QANF*EFICIFQKS\KIVKAI L*NGQRGLKFLNIKTCYKAIEIMKVLIWH KD\KKLD*WNSIQVSKVDPRVYHHLSFE KGDIEV*WGKGCSFQ
647	8698	A	1600	1	282	

648	8699	A	1601	1	453	EFGSQQLGRREEWQRQGSPVSRRLSARRGPQAPGTRLPRRHPARAFPAATMPKRKVSSAEGAA*LEPNSRSARLSAKPPAKGEAKPKKAAAKDKSSDKK\VQTKGKRGAKGKQ\AEVANQETKEDLPAENGETKTEESP\ASDEAGEKEAKSD
649	8700	A	1602	146	824	TWGKGDPKKPRGKMSSYAFFVQTCR\EEHKKKHPDASVNFS/ESFSKKCSERWKTMSA*R/EKGKFEDMAKA\DKARY\EREMKTYIPPQRGRQKRKFKDSQLHPRGPPSGLLSSSCSEYRPKIK\GEHP\GL\SIGDVAKKLGRDVGINTAAD\DKQPYEKK\AAKLKEKYEKDIAAYRAKGKPDAAKKG\VVKAEKSKKKKEEEEDEEEG\DEEDEEEEEDEEDEEDEEEDER
650	8701	A	1603	1	223	
651	8702	A	1604	1	400	FADD/PSDK/FFTSNNGMQFSTGHNDNDKFEGNCAEQDGSGWWMNKCHAGHLNGVYYQGGTYSKASTPNGYDNGIIWATWKTRWYSMKKTTMKIIPFNRLTIGEGQQHHLGGAKQVRPEHPAETEYDSLYPEDDL
652	8703	A	1605	18	365	NILIKVYFNSKNDFKIFHELFFKQNYMKNMYKSVINVIDIFMNKFQ/SEKYPII/DKGSLNK*MLTILALKSNTTVRLIRDTAFYYVREHIINVSSKRARYWVCVGFI*ASC*QPPLF
653	8704	A	1606	212	1645	HYKARSSGHSDIMSWSLH\ARNLILYFYALLFLSSTCVAYVATRDNCC\ILYERFGCYC\PTTCGIADFLSTYQTRVD*DLQSL\EDILHQVENKTS\EVKQLIKAIQL\TYNPD\ESSKPNMIDAATLKSRKMLEEIMKYEAS\ILTHDSSIRYLQEII*FQIIQKIVNL\KEK\VAQLEAQCQEPCKDTVQIHDITGKDCQD\IANKGAKQSGLYFIKPLKANQQFLVY\CEIDGSG\NGWTVFQKRLDGSVDFKK\NWIPYKEGFGHLSPTGTTEFLAGEMRKIHFD*GTQS\AIPYGI*GVGTGKTWEWARNQYCRSMPLFKVVHEVD\KYRFTYAYFAGGDAEDAFDGYDFG\DDPSDKFFHIPIMAMQFTYLGTMDNDKV*KANCA*/QQGWDPGWWDGNKC\HAG\HSSMGVLFTQGWALYFQKASYLPNGLWIMGIIWA\TWK\TRWVFR*RKPTMKIIP\FNRLTIGEGQQH\HLGGSQTGLETF
654	8705	A	1607	2	529	GTVAACGACYWLLGLMAVRASFENNCEIGCFAKLTNTYCLVAIGGSENFYSVFEGELSDTIPVVHASIAGCRIIGRMCVG\TEEILADVLKVEVFRQTVADQVLVGSYCVFSNQGGLVHPKTSIEDQDELSSLLQVPLVAGTVNRGSEVIAAGMVVNDWCAFCGLDTTSTELSVVE
655	8706	A	1608	18	889	GVQGTVAACGACYWLLGLMAVRASFENN\CEIGCFAKLTNTYCLVAIGGSENFYSVFEGELSDTIPVVHASI\AGCRI\IGRMCVGN\RHGLL\VPNNTTDQ\EL\QHISATGLPRHSGRFRAGWKERFLSLWGNFFNHLAIDYVGLGSNQD\LDKGRQEEISGQMLFKGWEVFRQTV\ADQV\LVES\YCVFSNPGRAWVPSPRPFQ*RPRNELSSISFKVPL\VAGTC*TKGSEVICLLGMGGEMNWCA\FCGPGTPNPAQSCQVVEECLQS*NEAPALAPIANRACGNSL\IDSLT
656	8707	A	1609	1	248	GPLIWEWPASPEPPPLPWGKPRMQ/SG*YG*TP*IPKIRFPKKPFPPFPQALEPQQKGPN*AHP*EPTPAKKYSPQRVQKVPK

657	8708	A	161	796	1381	SLTSDKRQWALGSMDKFKKHWICH/PIKMLHLGVGPKGLSVTQQFSSQN*FPVCAFQSSQYIPLPAQKLMYSQ*PVQNRCQSNQTIPVAHPMSGHQVSHHR\PANNPGKEEVPGQEGKN*NKDVNNF*TGQPWTKGNLEISTWPERNLILALKVPIKAELKRSWASSNCKQT*LRHPQCDDVFISMKEQSMEKCRNF
658	8709	A	1610	290	1414	NKRHPSRVYMSLPQG\EKVQAMYIWIDGTGEGLRCKTRTLDSEPKCVEELPEWNFDGSSTLQSEGFQTVNMYLVPAAMFRDPFRK\DPNKLVLC\EVFRYN\RRP\AETNLRHTCKR\IM\DMVSNQHPWFGMEQ\EYTLMGTDGHPFGWPSKG\FPGPQGQYLLGVG\GDRSLGRDIR\EAHYRACFY\AGTRIPGTKAGVSPLQ\WEFQIGPCEGIKQGG/HIFWVARFILH\RVCEDLG\VIATFDP*/RPLLGNWNGA\GCHTNFSTKAMRKENGLKYIEKAI*KLTNR\HKSHIRAYDPKRGLDNARRLTGFHETSNINDFSVGVANRSASIRIPRTVGQEKKGYFE\DRRPS\ANCDPFSVTEALI\RTCLLNETGDEPFQYKN
659	8710	A	1612	129	1182	
660	8711	A	1613	1	353	FGTRSFDSRSEAEAAKNALNGIRFDPEIPQTLRLEFAKANTKMAKNKLVGTPNPSTPLPNTVPQFIAREPYELTVPALYPSSPEVWAPYPLYPAELAPALPPPAFTYP\ASLHAQETL
661	8712	A	1614	129	1238	APPSPPSSGCSPQPQLSALTPGTRVLAPSFASFLPSFFLPPLAPALPLQVALPGPDCLGSPLPARALPRLSLALPESPAAAVADSPREPQPNPSPTATAPAPAPAPQPAAPARGSPGARGRLQWASAPSPSPAPQPCPARRGRTGKMNNGGKAEKENTPSEANLQEEEVRTLFVSGLPLDIKPRELYLLFRPFKGYEGSLIKLTSKQPVGFVSFDSRSEAEAAKNALNGIRFDPEIPQTLRLEFAKANTKMAKNKLVGTPNPSTPLPNTVPQF\IAREPYEL\TVPALYPS\SPEVW\APYPLLPRRELGACFYLPPG/SFTYPASLAWPRCAGSLPPRLLLRAGSPVSSAEYYTLQQWLLEGRTIALLWKYG
662	8713	A	1615	129	1143	APPSPPSSGCSPQPQLSALTPGTRVLAPSFASFLPSFFLPPLAPALPLQVALPGPDCLGSPLPARALPRLSLALPESPAAAVADSPREPQPNPSPTATAPAPAPAPQPAAPARGSPGARGRLQWASAPSPSPAPQPCPARRGRTGKMNNGGKAEKENTPSEANLQEEEVRTLFVSGLPLDIKPR\ELYLLFRPFKGYEGSL*KLTSKQL*GFVSFDSRSEAEAAKNALNGIRFDPEIPQTLRLEFAKANTKMAKNKL\VGTPNP\STPLPNTVPQFIAREPYELTVPALYPS\SPE\VWAPYPL\YPAELGPA\LPP\PAFT\YPASLRCPGNPVEKEIQDSV
663	8714	A	1616	1	669	
664	8715	A	1617	267	1057	GRTMMFGAKRRQEEWEKVRKPEDPEECPEEVYDPRSLYERLQEQKDRKQQELRGTVSNCKNM\VRG\LDEDETTFLDEVSRQQELIEKQPKR\EELERT*RNTEITSRRLEFSQENKKEVEKKLTCE/VL*KPRTKFSQANVLGQEL*SMKSSESGHQCEKT*NRTPEPD*QESRALILAKSLGNNLPLSGPFHPLAPSAASMYRHPPRPGWPTLGAATPSPASDSEGTIQCHRKDCSPPCFRTNTFLRGPLSFFRSLHREAPPQG

665	8716	A	1618	1	641	DTRFLERLRLSISSYVQTPMGHFTEEDKA TI\TSLWCKVNVE\DAGGETLGRLLVVYP WTQRFFDSFGNLSSASAI\MGNP\KVKAH GKKVLTSFGRLP*KHL\DDLKG\TFAQA* SE\LH\CDKAALLDPE\NF\KLPGEILLVTR FGQFHFRAKNFTPEGCQA\SWQERWVT WSWPVPCSSRLPLKLNCP*MQSFSRIRLL FLQAITNNKSISAKRSP
666	8717	A	1619	1	194	
667	8718	A	162	3	1116	LNQWQEQTGNPERTHRPSEGSGLLLQDP GDFSNTLSAPTAEVEKGDPLPKIPPLEEL KETHLTHKDSHKLKIKGWKKAFLANGH QKQTGEAILIPDKTKFKATAVKRDKEGD YIMVKGLVPQENITILNTYASNTEAPKFI KQLLIDLRNEIDSNIVIVGNFNTPVTAIDR SSKPKVNKETMDLNYTLEQMDLTDIYRT FHPTTAEYTFYSTVHETISKIDHMIGHKM SINTFKKIEIMSSTLTDHSGIKLKINSERNL QNHANTWKLNNLLLNEHWVKNEIKMEI IQLFELNNNNDTTYQNLWDTAKVVLRG KFIALNAYIKKTERAKKTIYSHTSGI*KQE QTKPKPSRRKEIIKIRAELNEIETKKTI
668	8719	A	1620	98	1136	ASDAFHSLSAPGLRLGSRSAARPATMTE QAISFAKDFLAGGIAAAISKTAVAPIERV KLLLQ\VQHASKQIAADKQ\YKGIVDCIV RIPKGAGGVLSFLEGQPLPTVIRYFP\TQA FNFRPFKD/KSYKQIFPGGAWDKHTQF\W \R*FGGANWASGVAAGADHPSCFVYPLD FARTGLGKGRWKSQAQSASFRGLG\DCL VKIHQVQTASRGLYQGLPVSPFTATIIYP A\AY\YGVY\DTAKGHASPTPSNT\HILLS RMNRARTVTARGAVGCPNPLKTVRR\R MIDAIRGAKGADIMYTG/TLVDC*RKNLS EDEGGQRPFFKGCVVQTLLRGHGGRPSV LVPVRTSSRRVI
669	8720	A	1621	4	101	VQWNDFGSLQNPPPGVSPFFWLSLPNNL GFKGSSSRPGPFLKF**KP/EVFRVNPDGF PFPAP*FGPPGPPKSWGFPP*PPPGVSPFF WLSLPNNLGFKG
670	8721	A	1622	3	1728	GDRTDGVWWWLGLSRRYAIPFNSLEPSS LGSCPLSIGTHK\ALHALELTTTDIQCGK AFNSSSSFRYHERTHTGEKPYECKQCGK AFRSASLLQTHGRTHTGEKPYACKECGK PFSNFSFFQIHERMHREEKPYECKGYGK TFSLPSLFHRHERTHTGGKTYECKQCGR SFNCSSSFRYHGRTHTGEKPYECKQCGK AFRSASQLQIHGRTHTGEKPYECKQCGK AFGSASHLQMHGRTHTGEKPYECKQCG KSFGWASRLQMHGRTHTGEKPYKCKQC GKAFGWPSNLRRHGRTHTGEKPYKCNQ CGKKWKDQNIEYEYQNPRRNFRSLIEGN VNEIKEDSHCGETFTQVPDDRLNFQEKK ASPEAKSCDNFVCGEVGIGNSSFNMNIR GDIGHKAYEYQDYAPKPYKCQQPKKAF RYHPSFRTQERNHTGEKPYACKECGKTF ISHSGIRRRMVMHSGDGPYKSSFLRSHP KVPGHGRRFAMNPTLLNKEDERGNKNV VTREHLDRMKNSCIVCNMGHSNTEIDV NVVMGNYERLERDARMTIRKKRKRYSD IRFRIMGRYTVRVEVLTAVNSE
671	8722	A	1623	1637	5763	KPGNGACAGREWCDGGGAAWNWRDP GLPVGDSGVWDRVLLELLGPRSPRPLDV GGPAAGTPGVLSRPCPSTAALAPKPFCA APRPQPDAPACAGATGGSCADFDSGVDF VRRRSSGLWGPQPPLSPVKNYTEMFQDP VAFKDVAVNFTQEEWALLDISQKNLYR EVMLDTFWNLTSIGKKWKDQNIEYEYQ NPRRNFRSVTEEKVNEIKEDSHCGETFTP VPDDRLNFQKKKAS\LK*NHVTALCVQK

						LA*VTHL
672	8723	A	1624	2	656	APTPTGQRVVRATPAQSAPVRLRRRSYDVNNPIPSNLKSEAKKAAKILREFT\EITSRNGPDKI\IPGSTVIAKAK\GLANSCLLNQSPGSLVTFQRGGPGVLVARL\PDGK\WSSPFS/ALGIAGFG\GGFEIGI*GIQTLVIILEF/DDPCC*EAFAKGGNLTLGGNLTVAVGPLGRNLEGNVALRSSAAVFTYCKSRGLFAGVSLEGSCLIERKETNRKFYC
673	8724	A	1625	141	1307	FHVNNPIPSNLKSEAKKAAKILREFTEITSRNGPDKIIPAHVIAKAKGLAILSVIKAGFLVTARGGSGIVVARLPDGKWSAPSAIGIAGLGGGFEIGI/EDTFTATYSL*ALPWLPSISVECHSSFLRLPSA*HIFLHPFTVNLMVSDLVIILNYDRAVEAFAKGGNLTLGGNLTVAVGPLGRNLEGNVALRSSAAVFTYCKSRGLFAGVSLEGSCLIERKETNRKFYCQDIRAYDILFGDTPRPAQAEDLYENLDSFTEKYENEGQRINARKAAREQRKSSAKELPPKPLSRPQQSSAPVQLNSGSQSNRNEYKLYPGLSSYHERVGNFYQPIDLTALYSFEGQQPGDLNFQAGDRITVISKTDSHFDWWEGKLRGQTGIFPANYVTMN
674	8725	A	1626	167	401	
675	8726	A	1627	133	312	VRVGEKLKPCFWPPEANPDP*CYLHLWILDSQTKSKPVLTSP*RPPNGILGTSVCFCTFY
676	8727	A	1628	1759	1967	SGCKPLTFPPP*SDSPVKEDPCR/SPPSHPRLPPHSLPALPFPTPNPPPPKIYTAVSRIWEMKDRCNIPI
677	8728	A	1629	167	1378	GNTLVTNMTEFWLISAP\GEKT\CQQTWEKLHAATSKNNNLAVTSKFN\IPDFKGWARWDVLVGL\SDEL\AKLGCIL*EGSWLKESRLQLHGLDVLEDSKDKVQENLLA\NGSGLGLPYITKVPSGDMAKYPIKQSLKNISEIIAKGVTQIDNDLKSRASAYNNLKGNLQNLERKNAGSLLTRSLAEIVKKDDFVLDSEYLVTLLVVVPKLNHNDWIKQY\ETLAEMVVPRSSNVLSEDQDSYLCNVTLFR/RRAVDDFQDTKPGENKF\IVRDFQYNEEE\MKADKK\EMDRAST\DKKKQFGP\LVRW\LKVNFSEAFIAWIHVKALRVFVESVLRYGLPVNL\QHMIFHRNNNPFKPLRQVLHESYIHLDSSA\AAIIDAPMDIPGL\NLSQQEYYPYVYYKIDCNLLKFK
678	8729	A	163	41	1133	HRTYKTKIHLKKQKQSTQATKSRMNAVVPHISILTLNVNGLNVPLKRYRVA*WIRIYQQTICCLQETHLTPNT\KDSHKLKVKGWKK\AFHANGHQKQAGVAILTSDKTNFKATAVKKDKEGHYIMVKGLDQQENITILNIYAPNTGAPKFMKQLLIDVRNEIDSNTIIAGDFNTPLTALDRSSIQKVNKETMDLNYTLEQMDLKDIYRTLHPTTAEYTIYSTVHGTFSKIDYMTGHKTSLNKFKKSEIISSSLSDHSGIKLEIDSKRNHQNHANTWKLNNLLLNEHWVKNKIKMEIKTF/FELNDNNGTAYQNLWDTAKAVLRGKFTALNAYIKKYERAQTDNLRSHLKELEKQQTKPKSSRRKKK

679	8730	A	1630	569	1050	PLESRRLARSSGGWAGITGTPMNIFTGPD PGPSERSAQPRVWDSTCCLKSNCWFRK VKATTPPMSSMMRQIPRMYMNA/WEKV QVVTEGRQHTNEGDHEHDDAQEDEDDG WSQEGTFKGFIFLPLNLCIDAHRQDQGP NQTCNPSTLGGRGGQITRPGDRDH
680	8731	A	1631	1	595	
681	8732	A	1632	2	1121	ARGCGRSSRSRSRSHRCLPFPPPPSRRPA SLGPERRPGSSRAAPAASRSLSGLSRASG TASCGRPPACPPARSPLPAGPWAARAMG TDSRAAKALLARARTLHLQTGNLLNWG RLRKKCPSTHSEELHDCIQKTLNEWSSQI NPDLVREFPDDL\ECTVSHAVEKINPDER EEMKVSAKLFIV\ESNS\SSSTRKVQLTW ACSVLGS/VAQLGFLWIHWLSPPI*KDGG LIFPWEHLQPYWEGI*KNLVQRQKGLLP* GTSDLDKTQLEQLYQWAQVKPNSNQVN LASCCVMPPDLTAFAKQFDIQLLT\HNDP KELAFWKASFQGRLFQGKAFP\DISSGTE WGAAVGLLRYSVIVKSRGIIKSKGYILQA KRRGS
682	8733	B	1633	63	458	SLENTVSTAISKAQNGAPSWGGYPSIHA AYQLPGTVKPLPAAVQSVQVQPSYAGG VKSLSSAEHNALLHSPGSLTPPPHKSNVS AMEELVEKVTGKVNIKKEERPPEKEKSS LAKAASPIAKENKDFPKTEE*
683	8734	A	1634	3	2303	EMEGKEDAQKVLKCMYCGHSFESLQDL SVHMIKTKHYQKVPLKEPVPAITKLVPS TKKRALQDLAPPCSPEPAGMAAEVALSE SAKDQKAANPYVTPNNRYGYQNGASYT WQFEARKAQILKCMECGSSHDTLQELTA HMMVTGHFLKVTTSASKKGKQLVLDPV VEEKIQSIPLPPTTHTRLPASSIKKQPDSP AGSTTSEEKKEPEKEKPPVAGDAEKIKE DSEDSLEKFEPSTLYPYLREEDLDDSPKG GLDILKSLENTVSTVINKAQNGAPSWGG YPSIHAAYQLPGTVKPLPAAVQSVQVQT SYAGGVKSLSSAEHNALLHSPGSLTPPPH KSNVSAMEELVEKVTGKVNIKKEERPPE KEKSSLAKAASPIAKENKDFPKTEEVSG KPQKKGPEAETWEAKKEGPLDVHTPNG TEPLKAKVTNGCNNLGIIMDHSPEPSFIN PLSALQSIMNTHLGKVSKPVSPSLDPLA MLYKISNSMLDK\PVYPATPVKQADAID RYYYENSDQPIDLTKSKNKPLVSSVADS VASPLRESALMDISDMVKNLTGRLTPKS STPSTVSEKSDADGSSFEEALDELSPVHK RKGRQSNWNPQHLLILQAQFASSL\SETT EGKYIM\SDLGPQERVHI\SKFTGLSMTTI SHWLANVEVTSLRRTGG\TKFLKEPGTQ GHPVFF\CNDCASQFRTASTYISH\LETHL G\FSLKDLSKLPLNQIQRQQ\NV*KVLTN KTLGP\LGATEEDLGSTFQCKLCNRTFAK QARSQTAP
684	8735	A	1635	133	500	YNTVNYKSHPEGQSMCWSMPVITATFG NPRRVDQPLRSGVQD\QPGQHGKIPSLLK IQKLAGHG\GACL*SQLLGRLRKENCLN/ SPGGGGCSEPSSRHC\IPAWAIA*DTI*KIK K*KPPKMRN
685	8736	B	1636	1568	1588	MGDQQLYKTNHVAHGSENLFYQQPPLG VHSGLNHNYGNAVTGGGMDAPQASPIS PHFPQDTRDGLGLPVGSKNLGQMDTSR QGGWGSHAGPGNHVQLRGNLANSNMM WGAPAQAEPTDGYQYTYSQASEIRTQKL TSGVLHKLDSFTQVFANQNLRIQVNNM AQVLHTQSAVMDGAPDSALRQLLSQKP MEPPAPAIPSRYQQVPQQPHPGFTGGLS KPALQVGQHPTQGHLYYDYQQPLAQVP VQGGQPLQAPQ

686	8737	A	1637	2	251	FFFFFLINKTKRLFTP*ALQWGYPSGSCGSVSQSCKCILRGRSRATISIEAEMVDL
687	8738	A	1638	36	530	NKVLPPAASEHSDCQISKHQVQLCP/PNIITLADIVKDPVSRTPALVFEHVNNTDFKQLYQTLTDYDIRFYMYEILKALDYCHSMGIMHRDVKPHNVMIDHEHRKLRLIDWGLAEFYHPGQEYNVRVASRYFKGPELLVDYQMYDYSLDTWRMGCMLASMIIQKEP
688	8739	A	1639	1	1833	
689	8740	A	164	265	446	
690	8741	A	1640	3	430	
691	8742	A	1641	137	1368	FHISLFEENRVLKQGSLPPPAAFLNTVTAQISQTSKSQALSRQPCSDHVGDPVPKAGHRV\YTDVNTHRPREYWEYE\SHVVEWGNQDDYQL\VRKLGRGKYSEVFEAINITNNEKVVVKILKPVKKKKIKRE\IKILGGIWRGGPNIITLADI\VKDPVSRTPAL\VFEHVNNTDFKQLYQTLTDYDIRFYMYEILKALDYCHS\RGIMHRDVKPHNVMIDHEHRKL*LIDWGLAEFYHPGQEYNVRVASRYFKGPELLVDYQMYDYSLDMWSLGCMLASMIFRKEPFFHGHDNYDQF/VCRMAKVLGTEDLYDYIDKYNIELDPRFNGYLG\RHSRKPMGTALSNSENQH/LLSSPEALDFLDKLLR\YDPPSHGLLAREAMEHPYFLHCCEGPRPRNGFHLAMPGCSTPVQQRPI
692	8743	A	1642	874	1183	TPMLEQLGNRYLQNIACYPFRNMCTYQLGCSGSRL*SQHF\GRPRQVDHLRSGVRDQPGQQGETPSLLKVQKFSWAWWRTPVIS\ATWEAEAGEVLEPGRRRLK
693	8744	A	1643	2	498	
694	8745	A	1644	49	538	SQTPMGHFTEEDQGLLSKSLWGK/VLNVEKMLGRKKTPLGKGSPLVVPTP\WDPKRFL*TSFGKTLSPPALLPHQWANPPK\VKGHHGKEGCLTFPWEDAHKAPLDDPQRAPFAPA*SELHCDKLHVDP\ENFKLLG\NVLVTV\LAIHF\GKEFTPGGCRASWAEDG
695	8746	A	1645	53	393	
696	8747	C	1646	116	379	
697	8748	A	1647	3	200	
698	8749	A	1648	1	637	MRSAARGPRQSCSAFNRFRAANSSSPGFGAPCGRQCWIWESLGKERAKEGKDGGLQSPRTSLKERPKTRITGALPMDHTEGLPAEEPPAHAPSPGKFGERPPPKRLTREAMRNYLKERGDQTVLILHAKVAQKSYGNEKRFFCPPPCVYLMGSGWKKKKEQMERDGCSEQESQPGAFIGIGNSDQEMQQL/NTLEGKNYCTAKTLYISDSDKR
699	8750	A	1649	111	748	GKREGAGERDQGRRRGESREGWSFGESLWKMAPVVTGKFGERPPPKRLTREAMRNYLKERGDQTVLILHAKVAQKSYGNEKRFFCPPPCVYLMGSGWKKKK\EQMERDGCSEQESQP\CAFIGIGNSDQEMQQLNLE\GKNYCTAKTLYISDSDK\RKHFMLSVKMFYGPTS\DDIGVFL\SKRIKVISKPSKKKQSLKNADLCIASGTKVALFNR
700	8751	A	165	283	398	NWQEKCTFQIIGGRKRMSFRIILINFFHN*DRTVCYVP
701	8752	A	1650	1	519	IISTD/KAEYT/FYEGMGPVFTPVTPVPVVESLQLNAGGDVAMLELTGQNFTP\NLRV/WFGDVEAETMYRCEQSMLCVVPDISGFR\EGWRWVRQPVQVPVTL\VR\NDGI\IYSTSL\TFTYTPEP\GPRPHCSAAGAILRANSSQVPPNESNTNSEGSYTNASTNSTSVTSSTATVVS

702	8753	A	1651	238	1713	STMAWIKRKFGERPPPKRLTREAMRNYL KERGDQTVLILHAKVAQKSYGNEKRFFC PPPCVYLMGSGWKKIKLQMKCDGCSEQ GSQPCAFIGIGNSDQEMQQLNLEGKNYC TAKTLYISDLDKQKHFMLSVKVFYGNSD DIGVFLSKSSKPSKKKQSLKNADLCIASG KERWALFNRLLSQTV\STRYLHV/EKEGN FHASSQQWGAFFIHLLDDDGSEGEEFTV *DGYIHYGQTVKLVCSVTGMALPRLIIRK VDKQTTLLDADDPVSQLHKCAFDLEDTE RKYLCLSQERIIQFQATPCPKEPNKEKIN DGASWAIISTHKAKHTFYRESGPLSLAP/ VSCPPALSVESLKLNGGGDEPSLKLNRT EFQLPKFYKVWFGDVE\AEAMYRCG\ES MLRVVPDVSAF*EGWR\YSQQPIQVSVT LVRNDGIIYSTSLTFTYTPEAGPRPHC\SV AGAILKASSSHVPPNELNTNSDGSYTNA STNSTSVTSSTPTVVS
703	8754	A	1652	1	309	FF*DRA*L\CPPGWSARSQHTVVSTFLGS SKFSHLGPPELPGDHRHAPPCPANFFYFS *RWGLPMLLVSNSQAQAILLPSPFQKGW DYRAWGHHTWGSYLNFNE
704	8755	A	1655	1	2325	
705	8756	A	1656	3	128	
706	8757	A	1657	203	2698	SANMGKKRTKGKTVPIDDSSETLEPVCR HIRKGLEQG\NLKK\ALVNVEWNICQDC KTD\NKVKDKAEEETENKPS\VWLCL\KC \GPQGFGRNFSR/EQHALKHYLTPRSEPH CLVLSLDNWSVWCYVCDNEVQYCSSNQ LGQVVDYVRKQASITTPKPAEKDNGNIE LENKKLEKESKNEQEREKKENMAKENP PMNSPCQITVKGLSNLGNTCFFNAVMQN LSQTPVLRELLKEVKMSGTIVKIEPPDLA LTEPLEINLEPPGPLTLAMSQFLNEMQET KKGVVTPKELFSQVCKKAVRFKGYQQQ DSQELLRYLLDGMRAEEHQRVSKGILKA FGNSTEKLDEELKNKVKDYEKKKSMPSF VDRIFGGELTSMIMCDQCRTVSLVHESF LDLSLPVLDDQSGKKSANDTP\LTKTVTY AECYSEEKYHTDCCIY*RSDISSGTRKHL QKKATKQAKKQAKNQRRQQKISGPALH LNDIRTIDHPEDSEYEAEMSLQGEVNITS NHISQEGVMHK\EYCVNQKDLNGQAKM IESVTDNQKSTEEVDMKNINMDNDLEVL TSSPTRNLNGAYLTEGSNGEVDISNGFK NLNLNAALHPDEINIEILNDSHTPGTKVY EVVNEDPETAFCTLANREVFNTGE\CQIQ HCLYQFTRNEKLRDANKLLCEVCTRRQ CNGPKANIKGE\RKHVYTNAKKQMLISL APPVLTLHLKRFQQAGFNLRKVNKHIKF PEILDLAPFCTLKCKNVAEENTRVLYSLY GV\VEHSGTMRSGHYTAYAKART\ANSH LSNLVL\HGDIPQDFEMESKG\QWFHISD THVQAVPTTKVLNS\QAYLLFYERIL
707	8758	A	1658	992	1863	GIWRNVHRQPQLESCEPTPACSGRACAC CPVSCGWSHGQDWMVPVAGRCTRAQR CCTGGASLPTVHKSTLSSCSAPPADSAA CVFIYFIIIF*RQSLNSVAQ\AGVQWR\NL KLLQPLPPAFKA\FSCLSLLCNWDYRRVP PGLANFCIFSRDGGFTMLVVRLVSNS*PC DLPASASQSAGIT\ALSHHAW\LLFFETES RSVVQAGVQWCDLGSLQAPPPGFTPFSC LSLQSSWDYRRPPPRPANF/CVFLVETGF HC*PGWSRSPDLMIPPGLSLPKCWDCRR DTKHPASKF

708	8759	A	1659	318	1681	SPRMHALVLLLCIGALLGHSSCQNPASPPEEGSPDPDSTGALVEEEDPFFKVPVNKLAAAVSQTSAYDLYRVRIQA*APRPNVLPVSLFKCGPTALSA\LSLGKRSKRNKNPIIHR\ALYYDLIKQAPDI\HGYLIRKLP*HGHFPPQKNLKSASR\IVFEKKLRIKSSFVAP\LEKSYGTRPR\VLTGNP\RLDL\QEINN\WVQA\Q\MKGKLARSTKEIPDEISIVLL/GV*AHFKGQ\WETKFDSRKTS\LEGFLLGMKERTREGPP*LSDPKGCFYAMGLGFRFSACKICPACPLTG\SMSIIFFLP\LKVTQ\NLTLI\EESLTLRS*FMTIDPRT*KTVAGGPSLSPKLKL\SYEGEEHPKFLAGR*SLQSLV*FHPDFSKI\TGK\PIKLDFRVEHPRLAFEWNE\DGAGNHPPSPRGLQPAHL\TFPLDYHLNQPFIFLLRDTDT\GALLFIGKI\LDPRGP
709	8760	A	166	283	397	NWQEKCSFQIIGGRKRMSFRIILINFFHN*DRTVCYVP
710	8761	A	1660	3	340	
711	8762	A	1661	2	500	GKPDPSTKKQHTIWPSPHQGNSPDLEVYNVIRKQSDVSLAETRPDLKNISFRVCSGEATPDDMSCDYDNMAVNPSESGFVTLVSVENEIYGY*DI*KTETDNNGKEMISKILLFSIRKIHRRSMNKLRSGPVDEHVVPTTSCWTPTFWLYPLSQPVIQLDLMRRYL
712	8763	A	1662	3	52	
713	8764	C	1663	92	244	MRCEIILVLIPYVYFYSNKLLCSRLXXXXXGGAVLKNPWGGQSLPGLAR**
714	8765	A	1664	336	413	
715	8766	A	1665	233	400	GGAVLKNPWGGPSLPGLAR**FFPYRGAY*NLPGNFWKEPLFLGGDILGQPPFGNL
716	8767	A	1666	194	360	GGAVLKDPWGGQSLPGLARK*FFPYGGPN*NLPGNFWKGPLLWGGDILGQPPYRN
717	8768	A	1667	319	391	
718	8769	A	1668	313	542	ALKQPT/PQTKEERAFDPRVHAE*IPYVFEIHIRST*KTT*NGNPTAPLPVRAPTPARVRTWPNPGHSCAGSHHSSR
719	8770	A	1669	143	1316	ERLEIGKELQLVWDEPHLTPGNDSLLPSSCCVTAASDLDLRGGQPVCRGGTQRPCYKVIYFHDTSRRLNFEEV\KFSCRRDGGQLGSIESEDEQKLIEKFIENLLPSDGDFWIGLRRREEKQSNSTACQDLYAWTDGSISQFRNWYVDEPSCGSEVCVVMYHQPSAPAGIGGPYMFQWNDDRCNMKNNFICKYSDEKPAVPSRRS*\GEETELTTPVLPEETQEEDAKKTFKESREAALNLAYILIPSIPLLLLLVVTTS\VCWVWICRKRKREQPDPSTKKQHTIWPSPHQGNSPDLEVYNVSKKTNAKSFLSETRPDLRNISFRVCSEES\PPDDMSCDYDNMAVNPSESGFVTLVSVESGFVTNDIYEFSPDQMGRSKESGWVENEIYGY
720	8771	A	167	2	1012	AEALVESFWKAKQHTKEELKSLQAKDEEKNENEKAKAACSAAAMEEDSEASSSSTGDSSQGDNNLQKLGPDDVSVDTDSIRRVYTRLLSNEKIEIAFLNALVYLSPNVECDLMYHKVYSQDPNYLNLFIIVMENRNLHSPEYLEMALPLFCKAMSKLPLAAQGKLIRLWSKYNADQIRRMMETVQQLITYKVISNEFNSQNLVNDDDAIVAASKCLKMIYYANAYAVTKNLGLYYDNRIRMYSERRITVLYSLVQGQQLNPYLRLIVRCDHIIDDALVRLEMITMENPADLKQFY/RGI*RRTRWVAAFWDRASEPKANSIGFGGSQLWMPTPVASYT

721	8772	A	1670	18	686	SPPPPPPAREMNFVRAANRRPRRVSRPRPVQQQQQQPPQQPPPQPPQQQPPHQQPSSPPQ*QQQQHPPASSPPPPPLPQERNNVGERDDDVPADMVAEESGPGAQNSPYQLRRKTLLPKRTACPTKNSLEGASTSTTENF\GHRAKRARVSGKSQDLSAAPAE\QYLQEKL\PDEVVLKIFSYLLEQDLCRAACVCKRFSELANDPNLWKRLYMEVFEYTRPMMH
722	8773	B	1671	155	310	MAAIRKKLVIVGDGACGKTCLLIVFSKDQFPEVYVPTVFENYVADIEVDGKQ*
723	8774	A	1672	162	877	AMAAIRKKLVIVGDGACGKTCLLIVFSKDQFPEVYVPTVFENYVADIEVDGKAGRSLACGDTAGQEDYD\RLRPLS*PDT\DVIL\MCFSIDSP\DSLE\NIPRKSWTPEVK\HF\CPNGGPSILVGELRRVLSGIDGATQGRGLRPRLKAGSPVET*RKGRDMGKQGLALFGYIGSCSSQRPKDWEVEEEVF*KWATESLLWQA*TLGKKKSGVPLSLVKPLLQAQPLMRLIFEVLFINLSV
724	8775	A	1673	1	711	
725	8776	A	1674	1	2647	MGVTSAASGLVGSAPQCVALPSEGWTLAVWPVAACTCSGVGSSPKLTPGSFVHCPWFLLLTEATRAEIKRPFSKAELKASVRPMEGSHCWGGEARRTSQGHTEQKGELRARRQAQNEDEDVKEVWVGKTKKEESDKLGCQGAWVPPRVPSWIGRFELWVVGYWEQPAVSWQMRVVRLLRLRAALTLLGEVPRRPASRGVPGSRRTQKGSGARTDSAWRRALTVISTSPGTSRMDPVALVAVGGPRRFPGGHTLQRLPVALRTLIPADQAHQAPNSTTWLGSRAGLLALAAGLGGIRDSAAHGPLQVGGMGGYTGMGSEVRWEKEKHEDGVKWRQLEHKGPYFAPPYEPLPDGVRFFYEGRPVRLSVAAEEVATFYGRMLDHEYTTKEVFRKNFFNDWRKEMAVEEREVIKSLDKCDFTEIHRYFVDKAAARKVLSREEKQKLKEEAEKLQQEFGYCILDGHQEKIGNFKIEPPGLFRGRGDHPKMGMLKRRITPEDVVINCSRDSKIPEPPAGHQWKEVRSDNTVTWLAAWTESVQNSIKYIMLNP\CSKLKGETAWQKFETARRLRGFVDEIRSQYRADWKSREMKTRQRAVALYFIDKLALRAGNEKEDGEAADTVGCCSLRVEHVQLHPEADGCQHVVEFDFLGKDCIRYYNK\VPGEKPVY*NLQLFMENKDPRDDLFDRLTTTSLNKHLQELMDGLTAKVFRTYNASITLQEQLRALTRAEDSIAAKILSYNRANRVVAILCNHQRATPSTFEKSMQNLQTKIQAKKEQVAEARAELRRARAEHKAQGDGKSRSVLEKKRRLL*KLQE\HLAHLSVQATD\KEENK\QVALGTSQLNYLDPRISIAWCKRFRVPVEKIYSKTQRERFAWALAMAGEDFEF
726	8777	A	1675	2002	2238	KGDFTKLPCL/C*SVPAFY*RSLKICCSIYLV*YMSVSVIESICYKYTVFCSRG
727	8778	A	1676	3	428	
728	8779	A	1677	263	899	ISYQEGTSAIQRK*QEVTLRK*TQESE/SAGNDSASTAPRSTEESLSEDVFTESELSPIREELVSSDELRQDKSSGASSESVQTVNQAEVESLTVKSESTGTPGHLRSDTEHSTNEVGTLCHKTDLNNLEMAIKEDQIADNFQGISGPKEDSTSIKGNSDQDSFLHENSLHQEESQKENMPCGETAEFKQKQSVNKGKQGKEQNQDFTGQRAG
729	8780	A	1678	1165	1530	VKNGGNEVIICHFHLTFGIYLLFFETEFCSCRPRLEC\NGAILAHCNLRLPGFKRFSCFSLPCC*DYRHLPPRPVKFFVVLVETGFHYLGQAGLKLLTPGDL/PPPLGLPKCVSHCAQPRVSTF

730	8781	A	1679	197	843	RLFSSNQTVDHSQKNVDITLKGTPQ*SCKGPRGT\LR\RDFN\HIKCGTSALLGKEKKRGFRVD\KWWG\SRRELGYPFGTI\CSHVQDHDPRGVTTGASRYQDEGPVYASPSPHPTVGLSQENGSSLLKSRNFFGVKKYIPQGFRMRPGCLLVSVSQGPRKE*INPLKGNDI*ALLQIPAAL\IPASPTRLKTKGIRKFFGWVSMSLEKGTVQPGLIE
731	8782	A	168	966	3172	
732	8783	C	1680	27	218	MLMADIRKEERNHLCRSSRRTWTILDRAEYSDHVVLQGAGVGWGTSXSPFLYSFEIPYGAQVA*
733	8784	A	1681	490	773	HPQIFVPGQESFNDRILKQPVEGLVVLREHERHSPSLRLHLEATQRLRHPGLLRLRGELLLWLIIRFIQTLPLPFAAKGPTRGAGIYPRGKQPVEGLVVLREHERHSPSLRLHLEATQRLCHPGLLRLRGELLLWLIIRFIQTLPLPFAAKGPTWGAGIYPRGKQPVEGLVVLREHERHSPSLRLHLEATQRLCHPGLLRLRGELLLWLIIRFIQTLPLPFAAKGPTWGAGIYPRGKQPVEGLVVLREHERHSPSLRLHLEATQRLCHPG/LPQAQGRAPSLAHHQIHPNTPSSFCSQGTYAGGWDLPQGQAAC
734	8785	C	1682	48	80	MGLWLFEHIY*
735	8786	A	1683	858	1055	
736	8787	A	1684	1	103	VFFLFGGDGVSLCHPGWSAVA*TQEAEEPFVQII
737	8788	A	1685	451	785	CSQDGGLRWDLVRHPQTFVPGQESFNDRILKQPVEGLVVLREHERHSPSL/PASS*GHTASPPPRSPQAQGRAPSVAPPPTTPQICPTTPSSFSSKRTYAGGWDLPQGQADC
738	8789	A	1686	1	1335	MNDDIRDSDLPDWRDRTPCVQKKAMDRTKTRFRKRGQITGKITTSRQPHPQNEQSLQRSTSGYPLQEVVDDEVLGPSAPGVDPSPPCRSLGWKRKKEWSDESEEEPEKELAPEPEETWVVEMLCGLKMKLKQQRVSPILPEHHKDFNSQLAPGVDPSPPHRSFCWKRKREWWDESEESLEEEPRKVLAPEPEEIWVAEMLCGLKMKLKRRRVSLVLPEHHEAFNRLLEDPVIKRFLAWDKDLRVSDKIPSEPTI/HGSITQNPSSGFSDLHPTFEYPSIPQFPNEYSHPNTEGGCQS*ARDSPLPS/VSGKLTSAGGLSWWCP*APT*FLSSATWPMTWRRTTRTPNKTSSTSCMGRPALAYPWSVTVGSSYAVA*TPCVQKKAMDRTKTRFRKRGQITGKITTSRQPHPQNEQSLQRSTSGYPLQEVVDDEVLGPSAPGVDPSPPCRSLGWKRKKEWSDESEEEPEKELAPEPEETWVVEMLCGLKMKLKQQRVSPILPEHHKDFNSQLAPGVDPSPPHRSFCWKRKREWWDESEESLEEEPRKVLAPEPEEIWVAEMLCGLKMKLKRRRVSLVLPEHHEAFNRLLEDPVIKRFLAWDKDLRVSDKIPSEPTILGASPKTLPLASQICIRPSNTPPSRNFQMSTVTPTLRVGASPELGTVPYLPLWEADLSRRPLLVVPLSTNLISVLSYLANDMEEDDEDPKQNIFYFLYGKTRSRIPLVRNRRFQLCRCLNPRARKNRSQIALFQKLRFQFFCSMSGRAWVSREELEENTGPRGDVDFQQELYSNANGRQQERGEEPFVQII
739	8790	A	1687	385	889	LEPTLTEQGYARAVLPIQEVEDVLFGVLVVLLHVIGQVESQEEMNALVLPGGEAGPAEIRYDHSQEILVRHPQIFVPGQESFNDRILKQPVEGLVVLREHERHSPSL/PASS*GHTASPPPRSPQAQGRAPSVAPPPTTPQIGPTTPSSFSSKRTYAGGWDLPQGQADC

740	8791	C	1688	1	1869	MDSPTPHDPAAPLLVTVLESVQKKTKDRTETSFGEIGQILGKIMTSHQPQPQEEQSPQRSTSGYPLQEVVDDEVSGPSAPGVDPSPPRRSLGCKRKRECLDESDDEPEKELAPEPEETWVAETLCGLKMKAKRRRVSLVLPEYYEAFNRLLAPGVDPSPPRRSLGCKRKRECLDESDDEPEKELAPEPEETWVAETLCGLKMKAKRRRVSLVLPEYYEAFNRLLAPGVDPSPPRRSLGCKRKRECLDESDDEPEKELAPEPEETWVAETLCGLKMKAKRRRVSLVLPEYYEAFNRLLAPGVDPSPPRRSLGCKRKRECLDESDDEPEKELAPEPEETWVAETLCGLKMKAKRRRVSLVLPEYYEAFNRLLAPGVDPSPPRRSLGCKRKRECLDESDDEPEKELAPEPEETWVAETLCGLKMKAKRRRVSLVLPEYYEAFNRLLEDPVIKRFLAWDKDLRVSDKIPSEPTILGASPKTLPPASRICIRPSNTPPPRNFHMSTVTPMLSYLANDMEEDDEAPKQKIFYFLYGKTHSHIPLRPKHWFQLCRPMNPRARKNCSQIALFQKRRFQFFCSMRCRAWVSPEELEENTGPRGDVDFQQELYSSANGRHQEGGEEPFVQII*
741	8792	A	1689	520	1235	WTDFRSIGLMALAGSVLEFSARSKDATPDPP/LGTGKVPSTAPTGAPPPGLPTAAFDVVLHPFRAGRKKYFPSLLFA*WLCQRSSP*RGADPVIGLYLVHRGGACQTPTLGNRQTPRLGIHARPRRRATTSLLTLLLAFGKNAVRCALIGPGSLTSRTRPLTEPLGEKERREVFFPPRPERVEHNVESSRWEPRRRGACGSRGGNFPSPRGGSGVASLERAENSSTEPAKAIKPIDRKSVHQICSGPVVPSLRPNAVKELVENSLDAGAH
742	8793	B	169	1	2187	MAGKASESWRKVKDTSCMAVTRENEKDAKAETPDKTIRSRETYYHKNSMWETAPMIQIISQGVTPTTHENYGSTIQDEIWCLTNFCLDDMLSFVLESCTNHCAYCLNVWYRKRAAAKHLIERYYHQLTEGCGNEACTNEFCASCPTFLRMDNNAAAIKALELYKINAKLCDPHPSKKGASSAYLENSKGAPNNSCSEIKMNKKGARIDFKDVTYLTEEKVYEILELCREREDYSPLIRVIGRVFSSAEALVQSFRKVKQHTKEELKSLQAKDEDKDEDEKEKAACSAAAMEEDSEASSSRIGDSSQGDNNLQKLGPDDVSVDIDAIRRVYTRLLSNEKIETAFLNALVYLSPNVECDLTYHNVYSRDPNYLNLFIIVMENRNLHSPEYLEMALPLFCKAMSKLPLAAQGKLIRLWSKYNADQIRRMMETFQQLITYKVISNEFNSRNLVNDDDAIVAASKCLKMVYYANVVGGEVDTNHNEEDDEEPIPESSELTLQELLGEERRNKKGPRVDPLETELGVKTLDCRKPLIPFEEFINEPLNEVLEMDKDYTFFKVETENKFSFMTCPFILNAVTKNLGLYYDNRIRMYSERRITVLYSLVQGQQLNPYLRLKVRRDHIIDDALVRLEMIAMENPADLKKQLYVEFEGEQGVDEGGVSKEFFQLVVEEIFNPDIGMFTYDESTKLFWFNPSSFETEGQFTPIGIVLGLAIYNNCILDVHFPHGLSTGS*
743	8794	A	1690	2176	2641	RKTIEEKADPKLQGFFVCLFVLETESCSASQAGMEWPNLNSLQPPPPGFTQFLC/SQPPE*LGLTGVPPHQAHFCIFSRDGASPC*PGWSPTPGLKRSTCFSLLKCWDYRHEPPRLAYFL\LFNRDEGLAMLPRPVSNSWPQVILLLWPPSVLGFQA
744	8795	A	1691	112	410	

745	8796	A	1692	2148	2510	SQHFGKLRQEDHLRSGVREQPGQHGKTPYLLKIQKL\AGHGGMCLYSQLLMRLRQENGVNPGGGACNEPRLRHCTPAWVTEQDSVSKKKTVHKKKLNWGSH\VRGET*RTSPCVALDTAHPL
746	8797	A	1693	178	730	IFFFFFKMESCSVAQAGVQWRDLGSLQAPPRGFTPFSCLSLPSSWDYRRPLPRPANFFYF**RRGFTVLATMVSIS*PHDLPTLASQNAGITGVSHHTQPVYALFFSFETEFCS\VAQAGGQWRDLGSPQPPPPRFKQFSHLSLPSSWDYRHAPPSLANFFCIFSRDRVSPSWSGWSRTPDLR
747	8798	A	1694	2	780	CWGLRRQRSQDVTTMAWALLILTLLTQGTGSWAQSALTQPPSASGSLGQSVTFSCSGTSSDIGNYNYVSWYRQHPGKAPKLMIYEVTKRPSG\VPE\RFSGSKSGNTASLTVSGLQ\SEDEG\DYYCCSMARHHS/VGWVFGGGTQVDPSLGQPKRAALGSLCFPPSLGEASSQPRPTLVCVISDFLPGKP*TVA*KA\DSSPVKAG\VETTPTPSKQ\SNNNYAATSY\LTLTPEPLKVPQEATACRVTP\EGGTLEKTVAPTECS
748	8799	A	1695	103	532	
749	8800	A	1696	112	1158	SCGLGHRKTFSFVSLPARNETQPKACREQNMEGDFSVCRNC*RHVVSANFTLHEAYCLRFLVLCPECEEPVPKETMEEHCKLEHQQV\GCTMCQQIMHKSSLEFHKANECQERPVECKFCKLDMQLSKLELHESYCGSRTELCQGCGQFIMHRMLAQRRDVCRSEQAQLGKGERISAPEREIYCHYCNQMIPENKYFHHMGKCCPDSEFKKHFPVGNPEILPSSLPSQAAENQTSTMEKDVRPKTRSINRFPLHSESSSKKAPRSKNKTLDPLLMSEPKPRTSSPRGDKAAYDILRRCSQCGILLPLPILNQHQEKCRWLASSKRKTSEKFQLDLEKERYYKF\KRFHF
750	8801	A	1697	343	586	KQQKTSFSSLPRRVNCNSHLVLL/RCDFKNCNLAFETKICQFIIKST*EYMFGFIFLCFFLLYNIPFHICGPRVKSSFCYRH
751	8802	A	1698	217	360	
752	8803	A	1699	1	390	WEEIQELNEVARHRPRSTLVMGIQQENRQIRELQQENKELRTSLEEHQSALELIMSKYREQMFRLLMASKKDDPGIIMKLKEQHSKELQAHVDQITEMAAVMRK\PLKLTSNRVARNKNEYFNLNKKTKA
753	8804	A	17	214	464	FCGLLLLHPVSADF*PAELINTQEPQERCQLDTGESSRVQHTLPSCPVQCGGTAELSRNVMIGASELKCLHPSPKLEYILPGN
754	8805	A	170	270	497	MHFLKAGRGGSRL*SQHFGRPRWADHE/RSGDRDNRG*HGETPSLLKNTKKN*PGTVAGALVASTREAEAGEWREPG
755	8806	A	1700	386	790	NSIMEEIQELNEVARHRPRST\LV\MGIQQENRQIRELQQENKELRTSL\EEHQSGLGNL**AKYREQM\LRLLMASKK\DDPG\IIMKLK\EQHSYD*HWYIVTSPKDSSLMHLDTSLKHLNMDWREGTWKQIRMYTK
756	8807	A	1701	1089	1295	CPPPLFFFETEFRSCCPGWSNSSLHRPPPGFKQFILNFLG*K/PSYPYLFAQSCARMCVCVCVCIIFTET
757	8808	A	1702	2	367	RDNTSPISVILVSSGSRGNKLLFRYPFQRSQEHPASQT/RFSDVILATILATKSEMCGQKFELKIDNVRFVGHPTLLQHALGQISKTDPSPKREAPTMILFNVVFALRANADPSVINCLHNLS

758	8809	A	1703	1	452	RCQYSTREAKLI/LALQD/EVSAMAD/GNE/GPQSPFHHILPKCKLARDLKEAYDSLCTSGVVRLHINSWLEVSFCLPHK1HYAASSLIPPEAIERSLKAIRPYHALLLLSDEKSLLGELPIDCSPALVRVIKTTSAVKNLQQLAQDALLPPRLP
759	8810	A	1704	1	468	
760	8811	A	1705	2	118	
761	8812	A	1706	1	671	DADSRFSEVF/LATILATQFEMCGQKFELKIDNVRFVGHPTLHRHALGQISKTDPSPKREAPTMILFNVGFALRANADPSVINCLHNLSRRIATVLQHEERRCQYLTREAKLILALQDEVSAMADGNEGPQSPFHHILPKCKLARD/PQLWLPNQQR*HDPHQPQHGQLQRRATSQRGLATEPEDDGEPAGQPVGA*TRSHPQCTRSPEP*GPPHVCQAPSLLPRP
762	8813	A	1707	230	345	
763	8814	A	1708	464	763	
764	8815	A	1709	3	156	GRHHL/EEEIMYNENTRGSQLLMLF*QSFAACWMVTTHEDPVIAVF\QALLP
765	8816	A	171	2	421	PAWLSRFTCAATYIKMPEE*ETHYQPMEEEEADTFTY/EAKMAPLML*IINTFYSSKEISLRELISNSSD/AK*LINPQSDFGFRVNLLGVLNA*INIFC*QALDKIRYESLTDPIKLDSGKELHINLIPNKQDRTLTIVDT
766	8817	A	1710	1	1878	FRGTWAPSASGSVLLRLPPPPAPSSSGPLRPRPRPHGGMRDNTSPISVILVSSGSRGNKLLFRYPFQRSQEHPASQTSKPRSRYAASNTGDHA\DEQDGDSRFSDVILATILATKSEMCGQKFELKIDNVRFVGHPTLLQH\ALGQISKTDPSPDEGKAP\TMILF*CWLFAL\RANADPSV\INCLHNLSRRIATVLQHEERRCQYLTREAKLIL\ALQDEVSAMADGNE\DPKPPFHHIL\PKCKLARDLKEAYDSLCTSGVVRLHINSWL\EVSFCLPHKIHYAASSLIPPEAIERSLKAIRPYHALLLLSDEKSLLGELPIDCSPALVRVIKTTSACERTCRQLAQDADLA\LLQVFQLAAHL\VYWGKAIIIYPLCENNVY\MLSP\NASVCLYSPAGPSSSSHQFPFSWTWPSVLAKFSLPVFLCQNFRNPLAPRCARRTQLH/IQMVVW\MLQRR\LLIQL\HTYV\CLMASPSE\EEPRPR\EDDVPFT\ARVGGRSLSTP\NALSFGSPT\SSDDMTLTKPQAWTTPSAELLPSGDSPL\NQRMTENLF/APSLSEHERAAIL\SVPAAQNPEDKNMFA/RGILHYFRGRHHLEEIMYNENTRRSQLLMLFDKFRSVLV\VTTHEDPVIAVFQALLP
767	8818	A	1711	1	613	PLKRSDGCNDGRPTRPPTRPDTTVFTSNLKQTRMVHLTPVE\KSAVTALWGQA*TWMKVGGKALGK/RCWVVLPWDPKRSFEVLWGNLSQLP\DAVNGANP*R*KASMAKEKVLGCPLSEWPLAHL\DN\LKGHPLPHTEVNLNCDK\LHRGSLKNFR\LLGQTCLVCVPGPINFWQKNSTPTSCKACLIKKSWLAWCWLNALGPTSIT
768	8819	A	1714	97	424	SPALWEAYDGWITLRSGVQD\QSGQHGEMPSLLKIQKLAGHDGECL*SQLLRRLRRENHLNLGGRGCSELRSRYCIPAWAPEIAPLHSSLGDLNKTLSQKKTKTVSFYI
769	8820	A	1716	18	367	SPPPPPRTTRWWPLRRPRLSLGTRAASLRFSSRKPCQNKPDYGLRSEKFR*SRK/A*GRQRP/PREKFPLPFPKKPIEPGEAKPGEIVNGSVRPPNMPLYIPTSIALPYFTFLLAVLTL

770	8821	A	1717	47	409	NSYIYMCIYSYINTIYIHIYLESNISLPLNIYISTPT/HIY*RHTV*VHTKAYVHML*HVYIHFCLCVHKSFKGTIYRDASFLESCSKVNTECHKLRKVKRKYSRIHHTGIHQSSFIMRKMS
771	8822	A	1718	89	1560	IMKHTNPEPGSFSRFYSLKVAPKVKATAAP\AGAPPQPQDLEFTKLPNGLVIASLENYSPVSRIGLFIKAGSRYEDFSNLG\TTHLLRLYIQS*RTKGASSFQDNPVGIGRQLGGQIKC*PQQGENMGLYWWECL\RGDVDI\LM\EFLLIV\TT\APEFRSLGK*VNLQPQLK\IDKAV\AFQNP\QTH\AIGNLHAAA/YTGNALANPLYCPDYRIGKVT\SEELHYFVQNHFTSARMALIG\LGVSHPVLKQVA\EQFLNMRG\GVGLSGWQRANYRGGEIREQNGDSLVHAAF\VAKSAVAGSAKPNAFSVLQH\VLGAGATMSRGAATTTS\HLHQ\AVSQATQQP\FDVSAFNARYS\DLGLFGI\YTISQGHQLAGDCIK\AA\YNQVKPIRSKKPFFPTQGVSAA\KNKG*KAGIPLMVQWKSFLKCSPGRKSGSPGLLV/GLVPYMPTHPTVPSSQMDSSGLMLDIIN/ARAKKFVFWARSSMGSKFGKFGDITPFCLMEL
772	8823	A	1719	53	420	
773	8824	A	172	1	267	CSAGGPWRAPQPRRFHRRRRPAQLPPPLPLPPLPASPRIHNRTF\PRPSQRTPPPAALGCPEPGS/RSQGRGHARPPGSGEGDPTVSSPGY
774	8825	A	1720	1	1260	
775	8826	A	1721	403	1334	DTMALTSDLGKQIKLER/EVEGTLLQPATVDNWSQIQSFEAKPDDLLICTYPKAGTTWIQEIVDMIEQNGDVEKCQR\AIIQHR\HPFI\EWARPPQPSGVEKAKAMPSPRILKTSPFHFSWLPPSFW\ENNCKF/LFMLASEIAKD\CMVS*\YHF\QRMNHMLP\DPVTWKEYF\ETFINGK\VFWGSWF\DHVKG\WW\EMKDRHQI\LFLFYEDIKRDPK\HEIRK\VMQFMGKKVE*TVLDKIVQETSFEKIKENPMTNRSTVSK\SILD\QSIFPPFMRKGTVG\DWEN\HFTVA\QNERFDEI\YRRKMEG\TS\INFCMEL
776	8827	A	1722	2	645	HGIQAHGQIPSYKTIGGRDDSFHTFFSETGAGKHVPRLLL*NWKPTVMDEVRTGTYCQLFHLEQFITARKIAANNYARGHYTIGKEIIDLVLDRIRKLADQCTGLQGFLVFHSFGGGTGSGFTSLLMERLSVDYGKKSKLEFSIYPAPQVSTAVVEPYNSILTTHTTLEHSDCAFMEEGEFSEAREDMAALEKDYEEVGVDSVEGEGEEEGEEY
777	8828	A	1723	87	1531	SLATMRECISIHVGQAGVQIGNACWELYCLEHGIQPDGQM/TQVTRPLGGGDDSFNTFFSETGAGKHVPRAVFVDLEPTVIDEVRTGTYRQLFHPEQLITGKEDAANNYARGN\YTIGKEIIDLVLDRIRKLADQCTGLQGFLVFHSFGGGTGSGFTSLLMERLSVDYCKKSK\LEFSIYP\APQVCTAVVEPYNYILTDHTT\LEHSDCAFMVDNEAIYDICRRNLDIERPTYTNLNRLISQIVSSITASLRFDGALNFTLTNFGTKLVPFP\RIPLPFCPIMPPVHFA*ERPPMNSFSV\REITQMLCFEPSPTRLVK\CDPRPWVKSWPCCLVATGGDVVPKRCQMLPIAHPSKPKR\TIQFVDWCPTGFKV\GINYQPPH\WVPGGNLA\KVTREAVCMLSKHHSPFAEAWARPGPTSFDLMLCQACPFVHWYLG\EGMEEGEFSEGRER*GCPFRKDYEKV\GVDSVEGEGEEEGKGILIIHSLFG

778	8829	A	1724	84	1560	EATTSPLRLRHQLGSREAATMRECISIHV GQAGVQIGNACWELYCLEHGIQPDGQM PSD/RKPLGEGDDSFNTFFSETGAGKHVP RAVFVDLEPTVIDEVRTGTYRQLFHPEQ LITGKEDAANNYARGHYTIGKEIIDLVLD RIRKLA\DQCTG\LQGFLVFHSLGGGNWV LVPPPPCLQLGGGGAGKRLSVDYGQEVP SWEFSIYPGAPRFPQPVVEPYNFHPTNPT PTLGAL*LCPSWVDNEAIYDICRRNLDIE RPTYTNLNRLIGQIVSSITASLRFDGALN VDLTEFQTNLVPYPRIHFPLGHIMPPVIFA E\KAYHEPAFL*QRSQMLCFEPAN\QM\V KCDPRPG\KYMLCC\LLYP\GDVVPQRISF LPLPTIKTQ/RLTIHFLDWSPTDFKLVINY QPPTVVPGG\DLTKVQRAVCMLSNT\TAI AEAWARLDHKFDLMYAKRAFVHWYVG EGMEEGEFSEAREDMAALEKDYEEVGV DSVEGEGEEEGEEY
779	8830	A	1725	153	380	EEYKTQNRFELRSPRLDCSGAISAHCNLC LPGS\SNSHAS\ASK*AGITGMHHHAWDN FCILFSRRWGFCHVGQGWP
780	8831	A	1726	14	322	IFSSEPLEGRPGRPGGARAACGQEGAGK\ AGAAGD*PSP/PG*GHAAAPKCREFGHN QIDAGWNQRP/GKPGLVPMWEPCPQPSC PLELSEFPPGAHSSWTSNSIY
781	8832	A	1727	605	3133	DSRGQEG*RTGAPHMGDKGPGVSGPPG FQASIKFGCGQN\FSPITLGPGPG/PWGGC GQALSPSGVPGLEGVSPTRAKGW\RFPP KAPETLNERQIYP\NAPPS*AG*\GHADTE GQDRTPHLLGANSSGHLCGQLPF*SASIG GAGRD\SQGLSRAFSSASKHSVPASAGTF *HSFSKG*VSKTTTTNAGNALFPMPGSSK TKKPNSHQRGQMGS*GRNPPSLGRAPAP LPEREAPIPAPQLGPSAAGTSRQVGQKSS TSP/PPGRGGNIEP*TQEERRKEKMKKAT GLSKHQPAGFIQNE*NLKGAGEF/GP/SGL AGSQNPPSSKLQGLGGKC*EQRL**GAG PDCSPLGKHTP*RSPSPLPRTGDASRG\S* GFSGKEASFGPGQPQSTCLSGIRPSLGS*P LGQ*RTL/PCSNLPAGK/RNCLG/PPGLGR GHGRCSDLSQHGSQT*AGANWRKRQ/PP VPAGLLDPGPLTAQQAVTRSPWEGAQG RGGEGPVGLCWG*ACAKCRLQGSGRTF AGGRQGSRSGVWVGSEVMAPRKRPPAG PPGHKEGTAEAVSSQTVTGGRIPEAVWP HHHQGKGTTEQEPCC*DVTKASAPGVS GDTG/MRGPLQPQASPNI*GAAACPFSQR AGSSLQQRRSLPAPSCPQAA/RGPPGLPG LPSSGSEENIHSGAWALVGQEGPSMDGR GNGMMLRGVWTGVHGGGMDEMWRRG DLKGKVPHGMIQVWTP/G/DKQDSSPAR TPAPQWLSITTGS*TPE/GDPGGKLDAAQ RGRAIAAHEQPEVAVLGVA/GHL*SPGS ARSSPRWHPHRSACRPPRSGGSPPSPSSA *KSDRTDAGAGVAAAASPGAGAPAHCP QGPPRSCQGPQRR
782	8833	A	1728	1096	1748	ELFPPTSTSIALAQLRALTQAGQPLTQVN QGAFSMPLWVLDPRERGDLKIKPSFLLL WGWAHLGFQHEALWALGCAFIEERGGE REAFLGPEMFSWGGFAHPCP*THQFWPG EPQ/EV*GGRHCGKAPREKWPALAPTFQ KEKPVVPVTPEAIPVCQEGAPPGTAKSIH CPPEIHTKEACPVPGKEENVPGKRKIWS KKRDRQGRAQESRIQGSEEIP

783	8834	A	1729	162	788	QKLFFLAENIIRSFSRTVKTLSFVLNQMMCFISVFDVFSFFSPGFTSFVISLCFGFAANLIGLGLAAKALDSGAFFSFVVLSPSFPLPSCPHHFTLLKVIMNTRSEIPFLAPSTLGFFEMESHCVTQ/CSGA/ISAHCSLHLPG*SNFPVSAS*VAGTTGASHDNWLIFLFLVETGFHHADQGGLKF*PQIIHPLGLPKWLGLQCEPCGWL
784	8835	A	173	218	430	
785	8836	A	1730	158	468	TGAGHGGLMPVIPSHFGRPWRADHLRSGVRDQPGQHG*NPVSTKNTKIGWA*WRAPVIP\AT*EGLRQGESLEPGRAEGARRCHYIPAGGDRVRLCLKKKKLN
786	8837	A	1731	1	1161	
787	8838	B	1732	1	1380	MDKFLDTYTLPRINQEELESLNRPITASEIVAIINSLSSKKSPGPDGFTAEFYWSVGSAGQAIRQEKEIKGIQLGKEEVKLSLFADDMIVYLENPIVSAPNLLKLISNFSKVSGYKINVQKSQAFLYTNNRQTESQIMSELPFTIASKRIKYLGIQLIRDVKDLFKENYKPLLKEIKEDTNKWKNIPCSWVGRINIVKMAILPKVIYRFNAIPIKLPMTFFTILEKNTLKFIWNQKRARIAKSILNQKNKAGGITLPDFKLYYKATVTKTTWYWHQNRDIDQWNRTEPSEITPHIYNYLIFDKPEKNKQWGKDSLFNKWCWENWLAICRKLKLDLFLTPYTKINSRWIKDLKVRPKTIKTLEENLGITIQHIGMGKDFMSKTPKAMATKAKIDKWDLIKLKSFCTAKETTIRVNREPTEWEKIFATYSSDKGLISRIYNELKQIYKKKQTTPSKSGRRT*
788	8839	A	1733	1	293	
789	8840	A	1734	1	1183	MKLKRNNEMSGKALDPREGFCDASYEIQTTIREYYKHLYANKLENLEEMDTFLDTYTLPRLNQEEVESLNRPITGAEIVAIINSLPTKKSPGPDGFTAEFYQRYKEELVPFLLKLFQSIEKEGILPNSFYEASIILIPKPGRDTTKKENFRPISLMNTDAKILNKILANRIQQHIKKLIHHDQVGFIPGMQGWFNIRKSINVIQHINRAKDKNHLIISIDAEKAFDKIQQPFMLKTLNKLGIDGTYFKI/Y/RDRHFSKEDIYAAKKHMKKCSLSLAIREMQIKTTMRYHLTPVRMAIIKKSGNNRCWRGCGEIGTLLHWCWDCKLVQPLWKSVWRFLRDLELEIPFDPAIPLLGVYPKDYKSCCYKDTC/H/IMFIVALFTIAKTWNQPKCPTMIDWI
790	8841	A	1735	66	1392	QVLLSFGTPLVLTTKREKNQIDAIKNDKGDITTDPTEIQITSIEYYKHLYANKLENLEEMDKLLDTYTLPRLNQEGVESLNRPITGSEIEAIINSLRPISLMNIHAKILNKILGN*IQQHIKKLIHHDQVGFIPGMQGWFNIRKSINVIEHINRTKDKNHMIILIDAEKAFDKIQQPFMLKTLNKLGIDGTYLKIIRAIYGKPTVNIILNRQKLEAFPLKTGTRQGCPLSPLLFNIVLEVLAKAIRQEKEIKGIQLGKEEVKLSLFADDMIVYLENPIISAQNLLKLTGNFSKVSGYKINVQKSQAFLYTNNRQTESQIMSELPFTIASKRIKYLGIQLTRDVKDLVKENYKPLLKEIKEDTNKWKNIPCSWVGRINILKMAILPKVIYRFNAIPIKLPMTFFTELEKTTLKFIWNQKRACIAKSILSQKNKAGGITLPDFK
791	8842	A	1736	1	432	
792	8843	A	1737	1	413	
793	8844	A	1738	1	1401	

794	8845	A	1739	1	510	MLEVLAWAVRQEKEIKGIQLGKEEVKLSL*LMSNFSKVSGYKISVQKSHAFVYTNNRQSESQIMSELPFTVATKRIKYLGIQLTRDVKDLFKENYKPLLNEIQEDTNKWKNIPCSWVGRINIVKMAILPKVIYRFNAIPIKLPMTFFTELEKTK\FIWNQK\RAHIAKTIL
795	8846	A	174	9	201	
796	8847	A	1740	1	2052	
797	8848	A	1741	1	762	MNIDAKILNKILAKQIQQHIKKLIHHDQVGFIPGMQGWFNIRKSINVIQHINRTEDKNHMIISIDAEKAFDKIQQPFMLKPLNKLGIDGTYFKIIRAIYDKSTPNIILNGQKLELMSNFSKVSGYKISVQKSHAFVYTNNRQSESQIMSELPFTVATKRIKYLGIQLTRDVKDLFKENYKPLLNEIQEDTNKWKNIPCSWVGRINIVKMAILPKVIYRFNAIPIKLPMTFFTELEKTK\FIWNQK\RAHIAKTIL
798	8849	A	1742	1	1057	
799	8850	A	1743	1	1380	
800	8851	A	1744	1	862	MDTFLNTYTLPRLNQEEVESLNRPITGSEIVAIINSLPSKKSPGPDGFTAKFYQRYKEELVPFLLKLFQSIEKEGILPNSFYEGSIILIPKPGRDPPKKENFRPTSLMNIDAKILNKILATRIQQHIKKLIHHDQVGIIPGMQGWFNIPKSINVIQHINRAKDKNHMIISIDAEKAFDKIQQPFMLKTLNKLGIDGTYFKIIRAIYDKPTANIILNGQKLEAFPLKTGTRQGCPLSPLLFNIVVEVLARAIRQEKKIKGIQLRKEEVKLSLFADDMIVYLENPIVSA*RLNQEEVESLNRPITGSEIVAIINSLPSKKSPGPDGFTAKFYQRYKEELVPFLLKLFQSIEKEGILPNSFYEGSIILIPKPGRDPPKKENFRPTSLMNIDAKILNKILATRIQQHIKKLIHHDQVGIIPGMQGWFNIPKSINVIQHINRAKDKNHMIISIDAEKAFDKIQQPFMLKTLNKLGIDGTYFKIIRAIYDKPTANIILNGQKLEAFPLKTGTRQGCPLSPLLFNIVVEVLARAIRQEKKIKGIQLRKEEVKLSLFADDMIVYLENPIVSA
801	8852	A	1745	1	1551	
802	8853	A	1746	1	947	
803	8854	A	1747	179	887	
804	8855	A	1748	1	1074	
805	8856	A	1749	1	1060	MDTFLDTYTLQRLNQEEVESLNRPITGSEIVAIINSLPTKKSPGPDGFTAEFYQRYMEELVPFLLKLFQSIEKEGILPNSFYEASIILIPKLGRDTTKKENFRPISLMNIDAKILNKILAKRIQQHIKKLIHHDQVGFIPGMQGWFNICKSINVIQHINRAKDKNHMIISIDAEKAFDKIQQRFMLKTLNKLGIDGTYFKWKNIPCSWIGRINIVKMAILHKALYRFNAIPIKLPMTFFTELEKTTLKFIWNQKRACIAKSILSQKNKAGGITLPDFKLHYKATVTKTAWGPYDR/DID/SWNQTDLMCAVLPSRYVTLQDSSIL*KMR*VKKLQKKSLQLADLVQGLRKDVSIT
806	8857	A	175	1453	1936	EVEKHLCQG*ELLRAQHN*AAACRRPRPPAPGPQCSAGGPMARAPAPQVPPPPPPCSA\PPPLPLPPLPAS/HAHPQPHFRHGRRSALLPRPPWAVRSRGALAGPRTRAAAGLRGGAGAAPAPADARFPASSPAE*PKFPQNSARALTGFPRCTDPTVSSPGY

807	8858	A	1750	1	1401	MSELPFTIASKRIKYLGIQLTRDVKDLFKENYKPLLKEIKEDTNKWKNIPCSWVGRINIVKMAIMPKVIYRFNAIPIKLPMPFFTELEKTTLKFIWNQKRARIAKAILSQKNKAGGITLPDFKLYYKATVTKTAWYWYQNRDIDQWNRTEPSKITPHIYNYLIFDRPEKNKQWGKDSLFNKWCWENWLAICRKLKLDPFLTPYTKINSRWIKDLNVRSKTIKTLEENLGNTIQDTGMGKDFMSKTPTAMATKDKIDKWDLIKLKSFCTAKETTIRVNRQPTKWEKIFATYSSDKGLISRIYNELQQIYKKKTNNPIKKWARDMNRHFSKEDIYAAKKHMKKCSLSLAIREMQIKTTMRYHLTPVRMAIIKKSGNNRCWRGCGEIGTLLHCCWDCKLVQPLWKSVWRFLRDLELEIPFDPAIPLLGVYPKDYKSCCYKDTCT/R/MFIVALFTIAKTWNQPKCPTMIDWI
808	8859	A	1751	1	1410	
809	8860	A	1752	1	1559	MDTFLDTYTLPRLNQEEVESLNRPITGSEIVAIINSLPTKKSPGPDGFTAEFYQRYKEELVPFLLKLFQSIEKEGILPNSFYEASIILIPKPGRDTTKKENFRPISLMNIDAKILNKILANQIQQHIKKLIHHDQVGFIPGMQGWFNIRKSINVIQHINRAKDKNHMIISIDAEKAFDKIQQRFMLKTLIKLGIDGTYFKIIRAIYDKPTANIILNGQKLEAFPLKTGTRQGCPLSPLLFNIVLEVLARAIRQEKEIKGIQLGKEEVKLSLFADNMIVYLENPIVSAQNLLKLISNFSKVSGYKINVQKSQAFLYTNNRQTESQIMSELPFTIASKRIKYLGIQLTRDVKDLFTSVISQVWVGSLDTSLILQLWVGSLDISVILQLWVGSLDTSVISQLWVRSLDTSVISQLWDIAFLSHVPGMLS*KSQVSLATLMQRMSSHGLGQLQPCGSAGYSSHGCFHRLALNACGSSSAQCKLLVDLPFWGLDGGLLLTAARGHSPGALCVRVPTPHFPSMLP
810	8861	A	1753	1	1575	MNTDAKILNKILANRIQQHIKKLIHHDQVGFIPGMQGWFNIRKSINVIQHINRTKDKNHMIVSTDAEKTFDKIQQPFMLKTLNKLGIDGTYLKIIRAIYDKPTANIILNGQKLEAFPLKTGTRQGCPLSPLHKFLDTYTLPRLNQEEVESLSSPITGSEIVAIISS/FTNEKESRTRWIHSRILPEV*GGT/RIKYLGIQLTRDVKDLFKESYKPLLKEIKEDTNKWKNIPC*WVGRINIVKMAILP/KELEKTTLKFIWNQKRACIAKSILIQKSKAGGITLPDFKLYYKATVTKTAWYWYQNRDIDQWNSTEPSEIMPHIYNYLIFDKPEKNKQWGKDSLFNKWCWENWLAICRKLKLDPFLTPYTKISSRWIKDLNVRPKTIKTLEENLGNTIQDIGMGKDFMSKTPKAMATKANIDKWDPIKLKSFCTAKETTIRVNRQPTKWEKIFATYSSDKGLISRIYNELKQIYKKK\TNNPIKKWAKDMNRHSSKEDIYAAKKHMKKCSSSLAIREMQIKTTMRYHLTPV
811	8862	A	1754	468	4080	RVRSGTDSIASGPRVLCSTRTERRRRRSYLVHRRCVPCGP\AVDGVFNLTNIDRWFLHINRAKDKNHMIISIDAEKAFDKIQQPFMLKTLNKLGIDGTYFRIIRAIYDKPTANIILNGQKLEAFPLKTGTRQGCPLSPLLFNIVLEVLARAIRQEKEIKGIQLGKEEVKLSLFADDMIVYLENPIVSAQNLLKLISDFSKVSGYKINVQKSQTFLYTNNRQTESQIMSELPFTIASRRIKYLGIQLTRDVKDLFK

812	8863	A	1755	1	2882	MDKFLDTYTLPRLNQEEVESLNRSITGSEIVAIINSLPTKKSPGPDGFTAEFYQRYKEELVLLLLKLFQSIEKEATLPNSFYEASIILIPKPGRDTTKKENFRPISLMNIDAKILSKILANQIQQHIKKFVHHDEVGFIPRMQGWFNIHKSKNVIQYINRTKDKNYMIISIDAEKAFDKIQQLFMLKTLSKLGIDGTYLKIIRAIYDKPTVKIILNGQKLEEFPLKTGTRQGCPLSPLLFNIVLEVLARAIRQEK
813	8864	A	1756	1	1746	MIISVDAEKAFDKIQQPFMLKTLNKLGIDGMYFKIIRAIYDKPTANIILNGQKLEAFPLKTGTRQGCPLSPLLFNIVLEVLARAIRQEKEIKGIHLGKEEIKLSLFADDMIVYLENPIVSAQNLLKLISNFSKVSGYKINAQKSQAFLYTNNRQTESQIMSELPFTIASKRIKYLGIQLTRDVKDLFKENYNPLLNEIKEDTNKWKNIPCSWVGRINIVKM\AILPKNWKKTTLKFIWNQKRACIAKSILSQKNKAGGITLPDFKLYYKATVTKTAWYWYQNRDIDQWNRTEPSEIMPPIYNYLIFDKPEKNKQWGKDSLFNKWCWENWLAICRKLKLDPFLTPYTKINSRWIKDLNVRPKTIKTLEENLGITIQDIGLGKDFMSKTPKAMATKAKIDKWDLIKLKSFCAEKETTIRVNRQPTKWEKIFATYSSDKGLISRIYNELKQIYKKKTNNPIKKWVKDMNRHFSKEDIYAAKKHMKKCSSSLAIREMQIKTTMRYHFTPVRMAIIKKSGNNRDMDEIGNHHSQQTIAMTKNQTPHVLTHRWELNNENTWTQEGEHHTLGPVVGNLKLLRKPKISLS
814	8865	A	1757	1	2866	
815	8866	A	1758	1	1285	MLEVLAWAVRQEKEIKGIQLGKEEVKLSLFADNMTVYLENPIVSAQNLLKLISNFSKVSGYKVSGQKSQALLYTNNRQTESQIMSELPFTIASKRIKYLGIHLTRDVKDLFKENYKPLLKEIKKDTNKWKNIPCSWVGRINIVKMAILPKDIIQENFPNLARQANIQIQEIRKTPQRYSSRRATPRHIIVRFTKVEMKEKMLRAAREKASHHTYSKIDPILGSKPLLSKCKRTEIITNYLSDHSAIKLEFRIKNL
816	8867	A	1759	2	231	PPSAS/CVQTGPPCHSLAFPPSAPGQEQEGHQLPSHVIPCHLALGTAFPQPAAMAGWGVSQATYCQELEPQFPPVSSS
817	8868	A	176	5	711	FEALRMIGHLFAKSPYHGKINSAKIVARTNIKLMVKVVMWKNGEIIDTLQIVYGDNAPKKSVAVYKCITSLRRSKVLDEACSSRPVTSICKGK\INLVYANISIGSAYTILM/EKLNLSKLSTHWMPQ/PVHPDQLKTRAKLSME/ILNKWDQDPKGFL*KIVTRDRTWLY*YTFEDKAQSKQWLPRGGSGPVKAKAGWSRAKVKA/TTGFWNAQIVLLVDFLEGQRTITSAYESILLKKK
818	8869	A	1760	1842	2096	CHSQKPQVPPPKPWGSLERP\PNT*VPACVLPAPAPAQRPGQIARQ*PWVAPGTSGQSRVGRTPGVSSGHGQTLTCPMALLQPLL
819	8870	A	1761	37	288	WGNTGSQVMTTVLNTALLPPKPSPMLPIKHYAIPPPSY/SPHP*PPIPSPTANLESAPPASAP/PPPLPP\PAQLGEAHAPPE*YAIPPPSYSHTRSHPSPAQQQTLSQRHQPLHLSSSASTLPSWGKLMHHLNNIPQ
820	8871	A	1762	397	506	SFLEDLTGLSNQPATAGANWITRLCTGSP*NV*PPWHMSSGHPEAVSRVCIFNLVGFGI
821	8872	C	1763	291	491	MGADRQTHPQDRWFSLHLIKLLRRSYRIEQPASHSRGRLDNTSLHRLSLCPCHPPLFLTLFLGIMF*

822	8873	A	1764	630	1159	SFYSALMLSDRKNGRERGRHGLSRRIKRQRKLVEAEAASQACLAGKPGPTPASHP/PGDGLPCPLSAPTLSPAT/ALPLP/SP*RSPNHSAN/PNPLSPTSSVKHSRCSSPHSALPLSTPKATPPSPNHRAGLFSSLPLAPMSTS*LLQKNCVLVRAPAPTSYIPVFFMTPAQCPVFLSAQ
823	8874	B	1765	1	1359	MGIKNSKRGSLPLAAPALLKPDTLWSCIFGEGDLGEEDMPPDPQAPSPAILPPNHAFGLWPFRYTQTHPQEAAADPAAAYHPEPPPLILAGVRFRSNPALPENGKGAWRGDGVAEGHAALWVLGLRCERSVTAALAARTREHDGRWREGAEKGPRRRWVVRAIQTPRLGKALIHCWTTRGSLWVNSSVSAGSERDQRADHAAAQTSCAAGAVACGLLLLLVRGQAWVKKQNLSPETRTKELVVSLMPLPHPGQGHNLASRAKARTQPVPSGPTHGAGAGESCPCEGRQAGVQTFLGIPFAKPPLVRCDLHPLSPLNLGVVWGWNHPSGHIYTPAHSHEGSNLPHWRQARNRQLGYLDQVAALRWVQQNIPTLEATLTVSPFLASLRWHECVFACCVPHIPRTFHGAIMESGVALLPGLLPAQLMSSPRFPGPCVFYEFQHQPSWLKNIRPRT*
824	8875	A	1766	2	597	RWLIPKVMRIYDTQKKMDREASQAALQKMLTLLMLPPTFGDLLREEYIGDNGDPQTLQAQFQEMMADSMFVIPALQVAHFQCSRAPVYFYEFQHQPSWLKNIRPPHMKADHVKFTEEEEQLSRKMMKYWANFARNGNPNGEGLPHWPLFDQEEQYLQLNLQPAVGRALKAHRLQLW\KKALPQKIQELEEPEERHTEL
825	8876	A	1767	3	1867	IHPSAPRLGKALIHCCSFPGQPLGEQQRVRRQRTETSEPTMRLHRLRARLSAGACGLLLLLVRGQG\QDSASPIRTTHTGQVLGSLVHVKGANAGVQTFLGIPFAKPPL\GPL\RFAPP*SPLESWSGVRDGTTHPA\MCLQDLTAVE\SEFLSQFNMTFPSDSMSEDCLYLSIYTPAHSHEGSNLPVMVWIHGGALVFGMASLYDGSMLA\AL\ENVVVVIIQLPPGGVLGFFSTGDKHATGNWGYLDQVAALRWVQQNIAHFGGNPDRVTIFGESAGGTSVSSLVVSPISQGLFHGAIMESGVAL/LLPGLIASSAD\VISTVVANLSACDQVDSEALVGCLRGKSKEEILCN*TSLFKMIPGVGGMGVFLAQGTPRELLASADFQPVPSIVGVNNNEFGWL\IPKVIEDLIDNPEGKLGQERASQG\VLQKMLTLLMLPPTFGDLLREVYIGDNGDPQTLPKRKF\QKMMADS\MFVIPALQVAHFQ\CS\RAPVYLPTSSQH\QPSWLKNIRPP\HMKADHG\DELPFVFRSFF\GGNYIKFTEEEEQLSRKMMKYWANFAR\NGNP\NGEGLP\HWP\LFDQGGAITLQLNL\QPAVGPGL*KAH\RL\QFWK\KALPQKIQ\ELEEPEERHTEL
826	8877	A	1768	2	288	CPNSSPGSASEVGCARSGQSSLLRSLPRCDGWPWAEAGA/MCAGRNLTSCSVGRY\YSSR*QDEES*TARHLLCAPQTGHQRRRPCRGQRNFCHIPC
827	8878	A	1769	1017	1463	PRGPWSQGEPKWLLARQAAGCCPPGACLWGHSPAGACSPLCAAKGSRYSRVPASSGTPAGK\GWQLLAREGEQEAGLCIEASQIGVPNSSPRKRPQR*DVPDRGSPVC*EVFPRCDGWPWAEAGASVQGGTSPPVSFNRMTSASTPNIW
828	8879	A	177	1	152	PGAMAVLLETTLSDVVIDLYTEERPRGEA*APLTCRRGPRACLPTFPSLR

829	8880	A	1770	1	1181	MAAYKLVLIQHGESMWNPENRFSSWYNTDLSPAGHKEAKCGRQHSGGLIGLNKAETAAKHGEAQVKIWRHSYDVPPPLMEPDHPFYNISKDRRFANLTEDQLPSCESLKDTIAKALPFWNEEIVPQIKEGKQPKYPFEKRLEVVNHYFTTDDGYRIISARFGVPRTQVRTWVALYEKHGEKGLIPKPKGVSADPELRIKVVKAVIEQHMSLNQAAAHFMLAGSGSVARWLKVYEERGEAGLRALKIGTKRNIAISVDPEKAASALELSKDRRIEDLERQVRFLETRLMYLKKLKALAHPTKKAAEIPRSTFYYHLKALSKPDKYADVKKRISEIYHENRGRYGYRRVTLSLHREGKQINHKAVQRLMGTLSLKAAIKVKRYRSYRGEVGQTAPNVLQRDFKATRPNEKWVTDVTEFAVNGRKLYLSPVIDLFNNEVISYSLSERPVMNMVENMLDQAFKKLNPHEHPVLHSDQGWQYRMRRYQNILKEHGIKQSMSRKGNCLDNAVVECFFGTLKSECFYLDEFSNISELKDAVTEYIEYYNSRRISLKLKDLYASCLTVQLFGVSTLEGLSEEAIMELNLPTGIPVVYELDKNLKPIQFLGDEETMRKAMEAVAAQVEDEYNLYGDVTTVSSLTPEKLAPEVKENVPERLNILLQVGGRSRTNLNRVRVPIHKHPSIRDPNSQASLNKLTDKMDSLWLKSKNRPKGPWKGEGAVKLFVSLENAAKPVFLQPSQRRVPGNNGSWEFPS*SRKSGISIGAVKRPTH*GS*KASSIS*NAAYVSKKAESLSSSHEKGCGDTAQYVLLSSKGSQQA*QVCGR*KAY**DLSRE*RPIRIP*GNAVSSSRRETD*P*SCSAPDGNPLT*SSD*GQAIPLLQRRGRANRP
830	8881	A	1771	362	551	DRLDPHSAAH*GAKSSPLAATSDQWHLALSRGSGSLYKCTEVKQMSNS*PASRSACPPPSPPR
831	8882	A	1772	2318	3200	FMPLHLDGGYCSPAEGFSSRYEHGLMKDLSRGSLSPGGERACEGVPSAPQNPPQRKKVSLLEYRKRKQEAKENSAGGGGDSAQSKSKSAGAGQGSSNSVSDTGAHGVQGSSARTPSSPHTKFFPSHSSMSHLEAVSPSDSRGTSSSHCRPQENISSRWMGSHISRTTP/SKEGASPRSSEAA*G/SAQKGEPSPTWESNITEKDSDPADGEGPETLSSALS*RSNSFTALSRYSYQT/PLAPFTGTPGYFSSQPHSGNSTGSNLPRRSCPSSAASPTLQGPSDSPTSDSVSQSSTGTL
832	8883	A	1773	53	1025	GTRHLEAVSPSDSRGTFLSHCRPQENISSRWMVPTSVERLREGGSIPKVLRSSVRVAQKGEPSPTWESNITEKDSDPADGEGPETLSSALSKGATVYSPSR\SATSSCSVIVLGQNHKASFSRVPPPSEDIPTQSPGYSYRTTALRPGNPPSHGSSESSLSSTSYSSPAHPVSTDSLAPFTGTPGYFSSQPHSGNSTGSNLPRRSCPSSAASPTLQGPSDSPTSVFSFSVPAQEL*ASTS/SSSEI/PRSSLAIRLTD*SVCPVLGQSAGYQGLQGICGFQFTALPHTVGVGFSTQYRIPSPLQGSRSQDSRRGLFLGLLGFGGKQN
833	8884	A	1774	1	414	AENTILSLMFSGKSWGSLSSECGALLPGTPTATRLQSLTRRSSLKRGT*GPQIPAARPREGSRIGTCTSS*\PGLRTEAHRSLRNRQAGVSSPFQLSPALKPRKSPSQATGQRPG*GQWGQKGSGSALLPTNTTHVEA
834	8885	A	1775	1	458	ENTILSLMFSGKSWGSLSSECGALLPGTPTATRLQSLTRRSSLKRGT*GPQIPAARPREGSRISQNQVGDGGKENRYRGFGGPPGTKSDPGHQHG*GGEGLWGSWRSKSGPAIATGAIASPATQLLRVNPDTGDWDVYFLLTLVSGLRLTGA

835	8886	A	1776	1	1387	HSMGWKEHVDRGGHTKGMVFVSLQPA CWLPRERPFQLRLCLIEDPLLRLCGQGR GRGQETTSGLILLSHVGTFLRDRWTLTSL WPCPRALLVFLSHSCEVMGAGAPGVSLP EGQLSPLPWLQVGRSSRRAPDSGQGPLG PPGLADVSMRGRAPGTSMCGS/RSTPVPP QSPGG*VSMPATPGIGFLCRLPHKSAPEG P/GGFGFLFFIKHLKQHCSLPSPRGLSITA STCVVLVGSKADPDPFCPHCPHPGPLTSS LRGAFSR/PSEQGRAGRGLESSRLSVSQG SCEASVLRPESRGSTHP/ISPVSGFTLRSW VAGEAIAPVAIAGPAGAGLR\GLRGALRP AHGHPRL*SPGNPISPSSTSPPCLMPQGHS CLPAGPPNPRCLSSFPPSPTLVLTNPASLS GPGCRDLGSLKSLSLKNFCGSDSEAELL VGVPGSRAPHSLLKLPQLFPENIKLRIVFS AKKKKK
836	8887	A	1777	46	591	LSPPKPQKQSQEQNPFCQRWALGKQLGP PQGGQEG/QGPPDSLVLPGV/PPVPLFVG GNLPHPPPP\PQPQRNKGRQTEGSCSPPF KGQHNS/PCGPQPS*AHPLRHGSGDQAQ PTSAP/PPCR/PES*PQADEMPTPCCHNTG KAL\GPPSQEGMEPGGPQPGPSRSTQSSV AHLTSGTAVRPGLGSPP
837	8888	A	1778	1412	1673	KRCPINRFPLECLPLPHLMGIPPEGHFH\H PLMGE**NPPCSIQDPHCVTYFETPPVNL CPSTRPPEVGWEGGPSSPPAFEAPGLKG
838	8889	A	1779	646	1098	MVELLVTFFPFSQLQLYFQLTYASFTELL KVPLMVLFYGMPMKKHFLKPTVSDQW ENNRKLKRRI\SR*FSCRKV*V*IAHCHKF CLVLREA/HMHWLILCAKKRF/PPLKKLT WLGMVSHTCNPSTLGG*GR*TA*TQEFK TSLDNMVKPHLF
839	8890	A	178	1112	2085	RHSHAVQKKPLSGGGAGAMAVLLETTL GDVVIDLYTEERP/RCQLYGDQASFFEAE KVPRIKHKKKGTVSMVNNGSDQHGSQF LITTGENLDYLDGVHTVFGEVTEGMDIIK KINETFVDKDFVPYQDIRINHTVILDDPF DDPPDLLIPDRSPEPTREQLDSGRIGADE EIDDFKGRSAEEVEEIKAEKEAKTQAILL EMVGDLPDADIKPPENVLFVCKLNPVTT DEDLEIIFSRFGPIRSCEVIRDWKTGESLC YAFIEFEKGGGAYGKTPATRPFYGSWPF AGLLLTCSFLRYPLILWITVLPPLSELIPL AAAERPSAASQ
840	8891	A	1780	109	943	WAKLGKGPAKR*PQALGASAPSALYPR HVAPARAPGRTKGAGSSCRNSPRQV\RP QPWQWGGGAQSDVSP*GQTPRGGSFER SSSCSGHTGLVGKERRPLSLEGP*/SPEDP PRARHGGPQGCREHPPWFSRPLCPEAGP EPRAPAWTSDSIGERSTGG/PSRPASKGP VPSAQRAGQTPGNPEAAGSLSLPCRALP QGREAPQPQPPPYLPLKLERGILVFALSK IFKN
841	8892	B	1781	98	195	GLCLGQEVGQEDLVMQTLPYGVLGLDR DEEVTG*
842	8893	A	1782	2	1556	

843	8894	A	1783	2	1928	ARGAPRLLRAAGAPSSSARVSLSVPSSPAMAALTRDPQFQKLQQWYREHRSELNLRRLFDANKDRFNHFSLTLNTNHGHILVDYSKN/LLVTEDVMRMLVGLWPKSRGVEAARERMFNG\EKINYTEG\RAVL\HVA\LRETGFKTHPILG*NGKDV\MPEVNKVLDKMKSF\CQRVRSG\NLKGYTGQRPFTD\VINIWIGGSDLGPLMVTEALKPYSSGGPRVWYVSNIDGTHIAK\TLAQL\NPESSLFIIASKTFTTQ\ETITNAETAKEWF\LQ\AAKDPS\AVGEDFLFALSTNTTKVKEFGIDPQNMFEFWDWVGGRYSLWSAIGLTSIALHVGFDNFEQLL\SLAHWMDQLFRTDAPGRKNAPVLLALLGIWYINCFGCETHAMLPYDQYLH\ALLRTSSRA\TWSPMGNTSPNLEPVWTTRQAPLCGGS\QGPMASMLF\TSCIHQGTKMIPC\DFLIPVQTQHPIRKGLHHKILL\ANFLAQDRGP**GGKSTEEGPKGASRVAGKSPED\FERLLPHKGL*KGNRP\TNFYVFTK\VTPIQLGAWSPMYEHKILRFRVIIW\DINSF*PSGELELGK\QPGLRKLEPELDG\SAQVTF\QDVSTNGLINFIKAAARGPRVPINSVLICSLLCDSHFFFSSLFSPKPELIVP
844	8895	C	1784	127	435	MAASXNPEVLDITEETLHSRFLEGVRNVASVCLQIGYPTXASVPHSIINGYKRVLALSVETDYTFPLAEKVKAFLADPSAFVAAAXLGCCHHSCSXCCCSPS*
845	8896	A	1785	112	1161	RTAVMPREDRATWKSNYFLKIIQLLDDYPKCFIVGADNVGSKQMQQIRMSLRGKAVVLMGKNTMHAQAPFEGTL*NNPSLWRKLLP\HIRGEFGLLFHPGRTLTEI\RDMLLAQ*GCPAAA\RPGAICPHVKVTVASPRTLGLG\PEKTSFFPGL*VSPTKNLQGAPIENPEVNVPAESRTGDQSGEPSESHGWLNML\NISPFFLWGWVIPARCSTNGQHSTKPLKVLGLFTGGKLLQFSAFLGGVSRKCLPSVCLPELAYPNCCNQYPDSIING\YKR\VLALSCGDGITPFPLAEKVK\AFLADPSAFVCCCNLWVAATTACFA/AAAAAPAKVEAKEESEESDEDMGFGLFD
846	8897	A	1786	2	355	RSITCKTKEARMLLAWVQAFLVSNMLLAEAYGSGGCFWDNGHLYREDQTSPAPGLR\CLNWLDAQSGLASAPVSGAGNHSYCRNPDEDPRGPWCYVSGEAGVPEKRPCEDLRCPGGRI
847	8898	A	1787	1	771	MLLAWVQAFLVSNMLLAEAYGSGGCFWDNGHLYREDQTSPAPGLRCLNWLDAQSGLASAP\VGYCRNPDEDPRGPWCYVSGE/AGVPEKRPCEDLRCPETTSQALPAFTTEIQEASEGPGADEVQVFAPANALPARSEAAAVQPVIGISQRVRMNSKEKKDLGTLGYVLGITMMVIIIAIGAGIILGYSYKRGKDLKEQHDQKVCEREMQRITLPLSAFTNPTCEIVDEKTVVVHTSQTPVDPQEGTTPLMGQAGTPGA
848	8899	A	1788	48	375	KGLIKPFGHRTPERKK*LAQGRKQATGMARAQLPDGAQHFSTALC*QLSRASNL*CHTQEALAAPSHKASFSEPFHLPMGRRVNGAFYGAIWFGDLNLKWSSCGNDAG
849	8900	A	1789	6	902	LQGWDWEAEPPPRGPRLNTGRSITCKTKEARMLLAWVQAFLVSNMLLAEAYGSGGCFWDNGHLYREDQTSPAPGLRCLNWLDA\QAGLASAPVSGAGNHSYCRNPDEDPRGPWCYVSGEGG\VPEKRP\CEDL\RCP\ETT\SKALPAF\TTEIQGNVLKGPSADE\VQVFAPANALPARSEAAAVQPVIGISQRVRMNSKEKKDLG\TLGYVLGITMMVIIIAIGDGIILGYSYKRGKDLKEQHDQKVCEREMQRITLP*SAFTSPTCEIVNEKTVVVHTS

						QTPVDPQEGSTPLMGQAGTPGA
850	8901	A	179	3	492	GGGAGAMAVLLETTLFYVAIF\LYTEKR PRACGNFLKLCRIKYYNYCLIHNVQRDFI IQTVDTTGTGRG*ESIFGQLYGDQASFFE AEKVPRIKHKKKGTVSMVNNGSDQHGS QFLITTGENLDYLDGVHTVFGEVTEGMD IIKNINETFVDKDFVPYQDIRIN
851	8902	A	1790	1	1995	LGRPTRPAPTFWAVAVRTRCLAEKRRQE LMGALCYPPQGDRFLQKSWIFFRPVMA DKLTRIAIGNHDKCKPKKRRQECKKSCP VVRMGK\LCIEVTPQSKIAWISETLCIGCG ICIKKCPFGALSIVNLPSNLEKETTHRYC ANAFKLHRLPIPRPGEVLGLVGTNGIGKS TALKILAGKQKPNLGKYDDPPDWQEILT YFRGSELQNYFTKILEDDLEAIIKPQYVD QIPKA\AKGTVGSILDRKDETKTQAIVCQ QLDLTHLKERNVEDLSGGELQRFACAV VCIQKADIFMFDEPSSYLDVKQRLKAAIT IRSLINPDRYIIVVEHDLSVLDYLSDFICC LYGVPSAYGVVTMPFSVREGINIFLDGY VPT\ENLRFRDASLVFKVAETANEEEVK KMCMYKYPGMKKKMGEFELAIVAGEF TDSEIMVMMLGENGMGKTTFIRMLA\GS LKPDEGGEVPVLNVSYKPQKISPKSTGS VRQLLHEKIRDAYTHPQFVTRL**KPLQI ENIIDQEVQTLSGGELQRVT\LAL*LGQN LPDVYLI\DEPPA\YLDS\EQRLMAARVV KRFIPHAKKTA\FVVGTWTFIM\ATYL\AD RVIVFD\GVPSTKNTVANSPQTLLGWA*I NFWSSAWKFTFQEELQTNYW\PRI\NKLI SLEDVDQKKSGN\YFFLDD
852	8903	A	1796	1217	2829	GARSEAAEFQQSASCRRLRGGGGPGTPG RGGALLASLLPPCRTPPDPPDGSCRCTRP LLSPLGKLSAPPRPRPLFVVAQAGHAPQ GLLPTSRPAAPATAGSRNMSTTLLSAFY DVDFLCKTEKSLANLNLNNMLDKKAVG TP/VAAAPSSGFAPGFLRRHSASNLHALA HPAPSPGSCSPKFPGAANGSSCGSAAAG GAVGGRRTALLNKENKFRDRSFSENGD RSQHLLHLQQQQKGGGGSQINSTRYKTE LCRPFEESGTCKYGEKCQFAHGFHELRS LTRHPKYKTELCRTFHTIGFCPYGPRCHF IHNADERRPAPSGG/ASGDL/RPTSRTPPP PSCSSASSCSSSASSCSSASAASTPSGAPT CCASAPAAAAAALLYGTGGAEDLLAPG APCAACSSASCANNAFAFGPELSSLITPL AIQTHNFAAVAAAAYYRSQQQQQQQGL APPRAP/APPSATLPAGAAAPPSPPFSFQL PRRLSDSPVFDAPPSPPDSLSDRDSYLSG SLSSGSLSGSESPSLDPGRRLPIFSRLSISD D

853	8904	A	1797	731	2553	GARSEAAEFQQSASCRRLRGGGGPGTPGRGGALLASLLPPCRTPPDPPDGSCRCTRPLLSPLGKLSDPPRPSPVIRGGSSPATPPQGLLPTSRPAAPATAGSRNMWTTLVSAFYDVDFLCKTEKYLANLNLNNML\DKKAVGTPV\AA\APSSGFAPGFLRRHSASNLHALAHPAPSPGSCSPKFPGAANGSSCGSAAAGGPTSYGTLKEPSGGGGTALLNKENKFRDRSFSENG\DRSQHLLHLQQQQKGGGGSPDQIPTRYKTELCRPFEEERARAQYGEK\CQF\AHGF\HELRSLTR\HPEVQDRSCAAPFHTIGFCPYGPRCHFIHNADERRPAPSGGASGDLRAFGTRDALHLGFPREPRPKLHHSLSFSGFPSGHHQPPGGLE\SPLLLDSPTSRTPPPPSCSSASSCSSSASSCSSASAASTPSGAPTCC\ASAAAALRLLYGTGGA*DLLAPGAPCAACSSASCANNAFAFGPELSSLITPLAIQTHNFAAVAAAAYYRSQQQQQQQQQGLAPPAQPPA\PPSATLPAG\AA\APPSP\PFSFQLPRRLSDSPVFDAPPSPPDSLSDRDSYLSGSLSSGSL\SGSES\PSFDPGRRLPIFSRLSISDD
854	8905	A	1798	146	403	RKLDVYFEYEEKIMSKTTLDKSLLDIISDPDAGTPEDKMRVFLIYYISTQQAPSE\AFTKMASAPASYGSTTTKPMGLLSRVMNTG
855	8906	C	1799	47	235	MXVXCNQIKXLVSYRAINRPDITDTEMETVMDTIVDSLFCFFVTLGAVPIIRCSRGNSSKKW*
856	8907	A	18	246	730	SSIMTFLESSAVPPHWTGQDGRVCWTGWIPQCQAGSAPE/RS*VFINSAGQKSADTGWSSSKPQN*QLSSTGAALPLASLSRERAW\VDDGKHRLTTPMTVPQRAVQQL*ETSG**DWRQKVQIFQQAVVGMIQPSHSQFLQREDVIMLRPFGLHLSWEENGS
857	8908	A	180	1	451	MGFRHVGQAGLELLTSGDLPASAYQSAGITDVSHCAQPASPLSYFLQALKHEFVVRHLTPGHLDTQTPDTKKPGHPDTQTLDTQTPSHLTSRHPDTQTADTQTPDTQ\NLTPGPPDT*HPDTWHLTPDTQTPGHPTLRHPDTQIPRHPET
858	8909	A	1800	48	2100	PAPGLPVLPRVEVFLEEPGSGSWEPRWRRRRQRQQQ\QPSFRKDSQLLSCVYCLSMCLILKTAQEHPYGRYSLMHRFGQDIFSPLLSVRELRDMGITLHLLLHSDRDPIPDVPAVYFVMPT\EENIDRMCQDLRNQLYESYYLNFISAISRSKLEDIANASVRGLSA\VTQVAKVW\DQYLNFITLEDDMFVLCNQNKELVSYRAINRPDITDTEMETVMDTIVDSLFCFFVTLGAVPIIRCSRGTAAEMVAVKLDKKLLENL\RDARNSLFYRVDTLGAGHF\SFQRPLLVLVDRNIDLATPLHHTWTY*ALVHDVLDFHLNRVNLEESSGVENSPAGARPKRKNKKSYDLTPVDKFWQKHKGSPFPEVAESVQQEL\ESYRAQE\DEVKRLKSIMG\LEGEDEGAISMAF/SDNTAKLTSAVSSLPELLEKKRLIDLHTNVATAVLEHIKARKLDVYFEYEEKIMSKTTLDKSLLDIISDPDAGTPEDKMRLFLIYYISTQQARS\EADLQQYKKALTDAGCNLNRSRYIKQ*RAFT\KMASA*AGYG\STTTKTMGLLSRVLN\TGSQFVM\EGVKNLVLKQQNLPVT\RILD\NLMEK\KSNPRKLMDYRYFDPKNACGGNDSS\VPQKLKIPFPRGHSFFVGGEEGNYI\EYQNL\CDYIKGKQGKHIL\YGC\SELFN\ATQFIKQLSQLGQK
859	8910	A	1801	1	394	

860	8911	A	1802	3	536	RIYIFRV/PMASCD/FSIRT/YTNADTPDDFQLHNFSLPEEDTKLKIPLIHRALQLAQRPVSLLASPWTSPTWLKTNGAVNGKGSLKGQPGDIYHQTWARYFVKFLDAYAEHKLQFWAVTAENEPSAGLLSGYPFQCLGFTPEHQGGSLKAAAGVPRHPDDSYGTSQEKWQLLKEKMFEPKK
861	8912	A	1803	192	2035	GRYLHPCFCLVDPLSFRDSGTPVVFSSSNDPEGMEFSSPSREECPKPLSRVSIMAGSLTGLLLLQAVSWASGARPCIPKSFGYSSVVCVCNATYCDSF\DPPTFPALGTFSRYGE/STRSGRTGWSLSMG\PIQANHTGTGLLLTLQPEQKFQKVKGFGGAMTDAAALNILALSPPAQNLLLKSYFSEEGIGYNIIRVPMASCDFSIRTYTYADTPDDFQLHNFSLPEEDTKLQDTPGFHRALQLAQRPVSLLASPWTSPTWLKTNGAVNGKGSLKGQPGDIYHQTWARYFVKFLDAYAEHKLQFWAATAKNEPSAGLLSGYPFQCLGFTPEHQRDFIARDLSPTLANSTHHNVRLLMLDDQRLLLPHWAKVVLTDPEAAKYVHGIAVHWYLDFLAPAKATLGETHRLFPNTMLFASEACVGSKFWEQSVRLGSWDRG\MQYSHSIHQQTSWYHVVG\WTAGNLALNPEG\GPNWVRNFVDSPIIVDITKDTFYKQPMFYHLGHFKQSSIPEG\SQRVGLVA\SQKNDLDAV\ALMHPDGSAVVVVLNRSSKDVPLTIKDPAVGFLETISPGYSI\HTYLW\RRQLDGADYSRRHWGSAGAFKGTESAHTLSVTKEGTAGPV
862	8913	A	1804	113	1799	PSAYSYGRYLHPCFCLVDPLSFRDSGTPVLFSSSSDPEVMEFSSPSREECPKPSGRVSIMAGSLTGLLLLQAVSWASGG/RPCIPKSF/SYSSVVCVCNATYCD\FDPPTFPALGAFSRYKSRSSGHWMELSTG/PIQANCTGTGLLLILQPE\FQKVKGFGGAVTDAGALNILALSPPAQNLLLKWYFSEEGIGYNIIWVPMAS*DFSIRTYTYADTP\DDFQLHNFSLPEEDTKLKIPLIHRALQL\AQRPVSLLASPW\TSPTRLKTRGAGNGKGPLKGQPRDIYHQTWARYIVKFLDAYAEHKLQFWAVTAENEPSAGLLSGYPFQCLGFTPEHQRDFIARDLGPTLANGTHHNVRLLMLDDQRLLLPHWAKVVLTDPEAAKYVHGIAVHWYLDFLAPAKATLRETHHLFPNTMLFASEACVGSKFWEQSVRLGSWDRGMQYSQ\SIIKKLPVPMWVGWEPNW/ITPSL*NITQATRFNKQP\MFLPPLANFSKFIP\EGS\QRVGLVA\SQKND\LDAVALMHPDGSPVVVVLNRSSKDVPLTIKDPAVGFLETISPGYSIHTYLWRRQ
863	8914	A	1805	22	424	ALGMAHITLFFFLLLFCDSLALSPRLQCSGTISAHCNLVPPGFKQFSCLSLLGSWDYRCMPPC/RWLTFVFLVETGFHHVGQAGLELLTSGDPPALA/FPKC*DYRR\DPRAWALFVFLT*FFSKLKYHKAKEKWS
864	8915	A	1806	14	253	LIPCGPQLFNCLSL*PGFWAMVKFAWVQYVRSCLSSSGCLKESRSSCSESGGDHHPLSSTSLPLSLFMLCKEVLELSGR
865	8916	A	1807	318	455	
866	8917	A	1808	1960	2150	CFVT\SNLKCSK*GRAWWFIPVISTLWEAKVGGSLEPRSLRLQCAMIAPLYCSLGDRVRPYLLK

867	8918	A	1809	2	1345	GVVPPGLLAGEGVCQLLRHSSPGRCLLKSRARGSVIMSRYGRYGGETKVYVGNLGTGAGKGELERAFSYYGPLRTVWIARNPPGFAFVEFEDPRDAEDALRGLDGKVICGSRVRVELSTGMPRRSRFDRPPARRPFDPNDRCYECGEKGHYAYDCHRYSRRRRSRAENLRR*SP*Q*IWLTIGAPLRFRKRNTRLTTFPTRKIFLRQSSLTWLIWLSV*SSLD*RKHLDAAIGYRYF*IV*IY*TMGQRGSTCKLARFMLNTHYSVLYYVMLSCNSAFNKSFFR**KKKYSTTNRPRVYFQMRH*I*IVLRFDFSRGTQTLKNELLSDILFFL*LEK*\SRSRSHSRSRGRRYSRSRSRSRGRRSRSASPRRSRSISLRRSRSASLRRSRSGSIKGSRYFQSP\SRSRSRSRSISRPRSSRSKSRSPSPKRSRSPSGSPRRSASPERMD
868	8919	A	181	143	647	LRSRCVQIQGSPATEPVSGSHCADTGLVIRGGALSAHAIAPGQRLSHALHTASAYINSGRMWDTVHLPQKRCVRPRPQGRVRTPRTRATH/NRVVGARRGTPQRYTG/WGRD*EPSLSQLPQNGDLLAARRREHPACSTGCTSGARVRSRVWRAGQALVPGCAGCAYILH
869	8920	A	1810	1	840	VVPPGLLAGEGVCQLLRHSSPGRCLLKSRARGSVIMSRYGRYGGETKVYVGNLGTGAGNGELY\RVIR*YGPLRTVWIARNPPGFAFVEFEDPRDAEDAVRGLDGKVICGSRVR\VELSTGMPRRSRFDRPPARRSFDPNDGCYECGEKGHYAYDCHRYSR\RRRSRSRFRSH\SRSRGRRYSRSR\SRSRGRRSRSASPRRSR/SPISLRRSR\SASLRRSRSGSIKG\SRYFPIPRRRSRSKIPGLFHGPRSSRSK\SRSP\SPKRSRSPSGSP\RRSASP\ERMD
870	8921	A	1811	20	701	DHASGQSTASSGPDSVSGQLQPSQPNADQGKLTTMRIAVICFCLLGITCAIPVKQADSGSSEEKQLYNKYPDAVATWL\NPDPSQKQNLLAPQNGCVL*RNQ*L*TR\TLPSKSN\ESHDHMD\DMDD\EGD\DDHVDSQDSIDS\N\DSDDVDDT\DDSHQSDESHHS\DESDELVTGFSTDLPATEVFTPVVPTVDTYDGRGDSVVYGLRSKSK\KFRRPDIKYPDATDEDI
871	8922	A	1812	121	1206	LIAGSTHACAHASGRAQHRRDQTRLKASCSLLSQTPTKENSLPRELPVICFCLLGITCAIPVKQADSGSSEEKQLYNKYPDAVATWLNPDPSQKQNLLAPQ\TLPSKSN\ESH\DHM\DDM\DDED\DD\DHVGTARDSIDSNDS\DDVDDT\D\DSHQS*WSLHHS*WNLD\ELVTGFFPTGPCPGNRSFSIPVCSPTVDTYDGRGD\SVVYGLRSKSK\KFRRPDIQYPDATDEDITSHMESEELNGAYKAIP\VAQDLNAPSDWANRGKDSYGTSK\LD*QSAETHR\HQQ\SRLYKRKANDESNEHSDCDW*ARTFPKVSRE\FHS\HEFSS\HGDFACL*PPKSKEEDNTPLEFRYSPGIRMWHFWGSI
872	8923	A	1813	171	459	
873	8924	A	1814	1	235	
874	8925	A	1815	292	1396	AQATGPYSRICACAKGAMAAS\CVLLHTGQK\MP\LIWSWGTWK\SEPGQVKAAVKVLPLALGYRHI\DCG\VIYGNELEIG\EALKGRTVG\PGKAGCLRGRKPGFVTSKLW\NTKHHPEGMWSLPLRKDSGLTFQLE\YLDLYLMHW\PYAFERGDNPFPKKCDWNIWLDSPH\YKET*RALKALVAKGLVQA/VWGLSNFNSRQI\DDILSVASVRPAV\LQ\VECHPITGLKMRLIA\HCQGTWAWR*TAFNPLGLPLNRAW\RDP\DEPVPAGGNPVVLGIGLKKYGRSPSSESCLRWPGPSGKVI\CIP\KSITPFSNPFRTFKVFDF\TFSPEE\MNQ

						LNA\LNKNWRYIVPMLT\VDGK\RVP\KDAGHPLYPF\NDPY
875	8926	A	1816	133	402	LLTSLVNSRILILFINSKKIFAIIIFSTRGGILRITAVIW\NNISVTHGNGDMALAQYSMPVPA*AIGRRILVMLYPSRTEAFEKFLIRC
876	8927	A	1817	356	463	
877	8928	A	1818	81	728	TRGPPPAEEMDEDGLPLMGSGIDLTK\VPAIQQKRT\VAFLNQFVVHT\VQFLNRFS\TVCEEKLADL\SLRIQQI\ETTLNIL\DAK\LSSIPG\LDDVTV\EVSPFKLSPSVTNG\AHP*RPLSE\QPQPEPVPPGLLDLQES*SIQAGNFL*L*PKDP\RYARYLKMVQ\VGVP\VMAIRN\KMISEGL\DPDLLERPDAP\VPDGE\SE\KTVEESSDSESSFSD
878	8929	A	1819	1214	1565	LKEITDEMVYRTLLHSHRIKMVSPIFPFSTNTVPFFPCYNPFFMNIQEMTKVTASRLFLFFVDLLQGVQPCFLCCCLCSIWFCNEHLDL**ASDFVMCMCVYMHIYTPIHV*YIHYIYVDTY/MEVCIHLYII*CV
879	8930	C	182	225	335	MLARLGSNSWTSSDPPTSASQTAGITGVSHRAGPLT*
880	8931	A	1820	1	1044	MAEKFDCHYCRDPLQGKKYVQKDGHHCCLKCFDKFCANTCVECRKPIGADSKEVHYKNRFWHDTCFRCAKCLHPLANET/FCGQGQQDP\CNKCTTREDSPKCKGCFKAIVAGDQNVEYKGTVWHKDCFTCSNCKQVIGTGSFFPKGEDFYCVTCHETKFAKHCVKCNKAITSGGITYQDQPWHADCFVCVTCSKKLAGQRFTAVEDQYYCVDCYKNFVAKKCAGCKNPIT/GEKDCVKSEPPSL*S*EAPSVPRETLASHPVSQRQPPGQASGWREDLSLVGGGSL*KKSKLSSSSWPGFGKGSSVVAYEGQSWHDYCFHCKKCSVNLATKRFVFPQEQVYCPVCAKKL
881	8932	A	1821	235	1119	GPSSYKVGTMAEKFDCHYCRDPLQGKKYVQKDGHHCCLKCFDKFCANTCVECRKPIGADSKEVHYKNRFWHDTCFRCAK\CLHPL\ANETFCG\QGQQRSCATSCTT\REGLPPSAKGCFKAIVA\GDQNVEYKG\TVW\HKD\CFTCSN\CKQVIGT\GSFFP\KGKDFYCVTCHETKFAKHCVKCNKAIASWGVTY*DEPWHAEGFVCVTCSKKLAVQHFTTVEDQ*YCVDCYK\NFVAKKCAGCKNPITGFGKGSSVVAYEGQSWHDYCFHCKKCSVNLANKRFVFHQEQVYCPDCAKKL
882	8933	A	1822	222	622	KCSSSKHFTKEDSQITNKHIEKCSS*LLVREMQIITTKSVSAIHQNG*NENTKQTCQ/DIDNDMQQWEFMR*EWANW*N*KTNWQ*LLRLDKCVS\YDPAIPFLDISPTERHIYAYHKTCIRMFKATLFKIAPNI

883	8934	A	1823	75	1402	VRRRTLSSRRWHRLSHGPRWLPQVLTASPPLQARGAFRSFPHSWGEDFLASLMFKIQLEPLKLRAWTLNGFVKFRNKETSAGPVAVMGKDYYKILGIPSGA\NEDLIVCAYRTMALKYHPDKNKEPNAEEKFKEIAEAYDVLSDPK\KRGLYDQYGEEGLKTGGGTSGGFRGF\FHYTF\YGDPHATFASFFGGSNPFDIFFASSR\ST\RPFSGFDPDDMDVDEDEDPF/GALFGRFGFQWG*VGGPR\RAPGTIVTLGRQGCRDPPVV\HELRVSLEEIYHGSTKRMKITRRRLNPDGRTVRTEDKILHIVIKRGW\KEGTKITFPKEGDATP\DNIPADIVFVLKDKPHAHFRRDGTNVLYSALI\SLKEALCGCTVN\IPLFD\GRGIPLPCNDVIKPGTVKRLRGEGLPFPKVPTQRGDLIVEFKVRFPDRLTPQTRQIL\KQHLPCS
884	8935	A	1824	245	486	
885	8936	A	1825	63	1820	RVDKGGLAAGLRPLGRGSRCACVREERE REGRLRGDFQPASLLSRGAINAPNFPACLKEEEDLSKAMSQDGASQFQEVIRQELELS\VKKELEKILTTASSHEFEHTQKKTWMDFRKLFHR\FLQRKGAFLWNLGEKFQRPP*DSIQPYEKIKARGLPDNISSVLNKLV\VVKLNGGLGTSMGCKGPKSLIGVRNENTFLDLTVQQIEHLNKTYNTDVPLVLMNSFNTDEDTKKILQKYNHC\RVKI\YTFNQSRYP\RINKES/LYFPVAKDVSYS\GEN\TEAWYPP\GHG\DIY\ASFYNSGLLDTFIGEGKEYIFVSNIDNLGATVDLYILNHLMNPPNGKRCEFVMEVTN\KT\RADVKGGGDNSLQYGRANLRTWWEIAQVPK/AHHVDEFKSVSKFKIFNT\NNLWISL\AAVKRLQEQNAIDMEIIVNAKTLDGGLNVIQLET\AVGAAIKSFENSLGINVPRT\RFLP\VKTTSDLLLVMSNLYSLNAGSLTMSEKREF\PTVPLVKIRPVLFRKVQD\YLKGFEK\IQNRLELDHL\TVSGRCDHLEKNGFIKGEPVIHPLQIHGDR\MDIPTWEPVFREPRLVSGNL\RILDH
886	8937	A	1826	48	239	GRAETMSDIEEVVE\EY\EEEGQEEAAVEEEEDWREDEDEQEEAAEEDSEAEA*D/TRETRAEEDE*YEDASD\AEDGPMEESELKP\WS*RPNLVL\P*VLI*FIVVYVDLHRLCME*DE
887	8938	A	1827	78	357	
888	8939	A	1828	3	327	
889	8940	A	1829	1	429	RAEVALKKKKALSSMRAHYS\SYLAKADQKRGKKQTAREMKKKILAERRKPLNIDHLGEDKLRDKAKELWETLHQLEIDKFEFGEKLKRLKYDITTLRSRSWDSTSSSPHNPVRGSLTVLGVERPSRGVPRVCVLAAFIPWGL
890	8941	A	183	1108	1627	PMDQVMCRT*KG*MGGQRDVSPTASEQVSTARPGPRAVIDYSKADAWAVGAIAYEIFGLVNPFYGQGKAHLESRSYQEAQLPALPESVPPDVRQLVRALLQREASKRPSARVAANG\LHLSLWGEHILALKNLKLDKMVGLAPPKIGRHFVGQTGSQEEVVVLETKNEDALFG
891	8942	A	1830	3	986	HTPATQSLANGLLGRSNVTITRGCEPGASACSRCCPQGAPALLTLDPQKPPTFTMSDEEVEQVEEQYEEEEEAQEEAAEVHEEVHEPEEVQEEEKPRPKLTAPKIPEGEKVDFDDIQKKRLNKDLMELQALIDSHFEARKKEEEELSALLERIEKRRAE\RAEQQRIRAEKERERQNRL\AEEKARRE\REDATRRAEDDL\KKKKALSSMGAN\YSSYLGPRLDQKRGKK\QTA\REMKKKILAE\RRKPLQPSIHLGERQN*GDQGQRSFWETLH\QLEDLTKFEF\GEKLKR\QKY\DITTLQEPECRCWPES

						TSKEGLGPPAKGKV\GGRWK
892	8943	A	1831	7	1382	PPGLEARPAPARLAGSGVCSGGRGRGAGRRSRRQSMRGAARAAWGRAGQPWPRPPAPGPPPPPLPLLLLLLAGLLGGAGAQYSSDRCSWKGSGLTHEAHRKEVEQVYLPCAAGAVEWMYPTGALIVNLRPNTFSPA\RHLTVCIRSFTDSSGANIYLEKTGELRLLVPDGDGRPGRVQCFGLEHGG\LFV\EATPQS/QDIGRRTTGFQYELVRRHRASDLHELSGECPARSSSSSSSSSSSSSPPARAANSHLKWRWSQRCLDVDTLPDLALLSVRIL*RWWAAFQSLSRPGCFLTLPFFS\APCRPCSDTEVLLAVCTSDF/A*VSPRQLLSSSSSSSSSSSSSSPHLLPRTAVRGSIQQVTHEPERQDSAIHLRVSRLYRQKSRVFEPVPEGDGHWQGRVRTLLECGVRPGHGDFLFTGHMHFGEPR\LRCAPKASRTFQRMYR\DA\QERGLNPLVGWQRN
893	8944	A	1832	1	433	NNPDFKAGV/MALPTL/LQIQRHDDYLVMLKAIRILVQERLTQDAVAKANQTKEGLPVALDKHILGFDTGDAVLNEAAQILRLLHIEELRELQTKINEAIVAVQAIIHFWHVWKSKCHILGGGSPENWVCSRDLPPLLIAFFFNKV
894	8945	A	1833	1	459	
895	8946	A	1834	2	1108	SFRSDSAPARPLAASPVPAPPAPPRFFSPGRGPGDQSEKRWTMFRRKLTGSSTTY\SPFVFNRRDETEFRNFI\VWLEDQKIRHYKIEDRG\NLRNIHSSDWPKVL\EKYFK\DVNCPFKIQD\RQE\TIDWLLGLAV\RLEYGR*WLKNTKDLVP**FQNLLDNATKN\AEPFDPFWDVNNP*F*GLVLLALG*TWLQI\QRHDD\FLV\MLKANSGFWVQEPP*PPGMPVCLRANSNKRGA*PVAFRQTHILGFD\TGDASSLMKLLEILRIACT*EELRELTDQKSTKAIVAVQAIYC*SKRQDHRLGKSLEDEHFEDLQLLTYFRYMLGNHTLLACFGKSKCHNSRGEGSPEKLGYGSRGFYHHWLIASCFFL
896	8947	A	1835	1	891	
897	8948	A	1836	1	984	
898	8949	A	1837	1	1917	
899	8950	A	1838	2	1411	FVGKGPRQAEDSRCGAGRRTGRTLGEGQRACVWCVPKGRKVAKGGESEWVEGGEGREEKKVGGGPGGRVAAHSGPTGGSAMRRVTLFLNGSPNNGKAGAGYGTLSDLLSGGSSKPGIKATNVYNGKGGLIDDIALIRDDDVLFVCEGEPFIDPQTDSKPPEGLLGFHTDWLTLNVGGRYFTTTRSTLVNKEPDSMLAHMFKDKGVWGNKQDHRGAFLIDRSPEYFEPILNYLRHGQLIVNDGINLLGVLEEARFFGIDSLIEHLEVAIKNSQPPEDHSPISRKEFVRFLLATPTKSELRCQGLNFSGADLSRLDLRYINFKMAQFKPL*\FAHANLC*ANLERTDLYGSVLDCANLQGVKMLCSNAEGASLKLCNFEDPSGLKANLEGANLKGVDMEGSQMTGINLRVATLKNAKLKNCNLRGATLAGTDLENCDLSGCDLQEANLRGSNVKGAIFEEMLTPLHMSQSVR

900	8951	A	1839	1	320	
901	8952	A	184	56	335	TGFCFFSRVKCNGTILGPCNL*IS/GSKYFSGL/SLPSKWDFRFAPPRPGNFLFF**TRFSPVYQDGFDFLTSICPPLGLPKLLEFRGAPPLPSE
902	8953	A	1840	1	1430	MAAAEAANCIMELPRAFGIRPSGGSYPPSHVEEGWGRFRPGPHVAAARPPPRGPGHTPWGVIDLGPSTMWGVSWEEQCFSALYQPPSELRGHLLGYRTRFCAFWVSCGQAESSEKPNAEDMTSKDYYI*LHTHTFGIHEEMLKDEVRT\LTYRNSMFHN\RHLFKDKVVLDV\GSGTGIL\CMFCCQGPWPRKVIGIECSSYSS*LWR*RCVQA\NKLRPRRGTSIKGKGGRKVELPVGERWDIIHQRVGWGYCLFLTESM\LQHRALMPRDKWLAP\DGL\IFPD\RAQLYVTAIRGTGRYKDSRSHLLGENVY\GFDMS\CIK\DVPIKEPLVDVVDPKQLVTQRLAFIKEV\DIYT\VKVEDL\TFNLPRFCPCKLKRN*LTCTALVTLLSTFEFTHCHKRTGGTGFFHQPPRSP\YTHWKQ\TVFY\MED\YLTRERRAEEIFGT\IG\MRPNAKEQPGTLDFTIDLDFKG\QLCELS\CSTDYRMR
903	8954	A	1841	1	45	
904	8955	A	1842	2	580	GRVGGRVGCEPPAWIDIYKAAGRSSFEQE*ARKMSS*AAFRTSFVLGA\EDGCISTQGSWGKVMRMHGPEPHPMRELQEMIDEVDEDGSGT\VD\FDEFLVM\MVRCMKDDSK\GKF*GRSLSDLLPACFDQKMLDGYI\DL\DELED*LLQATGRDPFTEDDDIEEL\MKDGDK\NNDGRID\YDEFL\EFMKGVGVDA
905	8956	A	1844	2	368	
906	8957	A	1845	28	479	
907	8958	A	1846	4	458	
908	8959	A	1847	90	769	
909	8960	A	1848	231	909	HCSQHLPSLWISFCFIIPANQFIFRLCTSEAMGKISSLPTQLFKCCFCDFLKVKMHTMSSSHLFYLALCLLTFT\SSATAGTGDGSAGAEL\VDALQVPCVEDRG\FYFNK\PTGYGLPAVRRAPQTG\IV\DECCFR\SC\DLRRLEMYCAPPQACPSQLRSVRA\QRHTDMPQDPERKYI*RTQVEGVQETRTTGLLEDPPGGVKSDMPPQDPLLCTSYLLNFGTPTKK
910	8961	A	185	523	817	SQHSVGPRQADRLRSGVRDQPGQHGETPSILK\IQKLPGRGGACL*SQLLGSLRRENCLNPGGRGCSEPRSHHCSPAWMTE*DSISKNK*INKNEIKKK
911	8962	A	1850	141	439	
912	8963	B	1851	851	1807	MAIKSIYAALRSIYHSEGHRGLFSGLTATLLRDAPFSGIYLMFYNQTKNIVPHDQGPPLGMFLGQAIHKAQRSCKPALPGPEELPTQGKNWK*
913	8964	A	1852	913	1375	SIFPGVVIEHLTLTFIYYHFIINRTSQGIDSQILSLFLFFF/CFFETESRSVTQAGVQ\WRHLGSLQPPPPWFKRFSCLSLQSSWGYRHVPPHPG*FLVFLVGDGGFTMLGQGWSQNSCTSRRSTRLRLAQPLFSQFKNCFKNCKSSIGLIPLYYY
914	8965	A	1853	1295	1679	KCINCKVYFTGVFFLIPTCQMQIHIFVCLCLVIISIHISFFYFIYFYDIIS*MCNL*\ILLDYFNPLEITIHAFCIQFM**LIYL/CFKCILFCGFLLGCFLCFLLKIYRF**S*FSFSLKCIYSFYSLV
915	8966	A	1854	2	410	
916	8967	A	1855	3	322	

917	8968	A	1856	1	666	SGRDDQGRRAQCSAARCGRPSGGVMEDERSFSDICGGRLALQRRYYSPSCREFCLSCPRLSLRSLTAVTCTVWLAGYGLFTLCENSMILSAGIFITLLRPLGVSPSVKNDQETLL\IIDSLG\IQMTSSYG\SGKESTTF\IEMGKVK/EIFVNNEAIYMVSI*KHKAIYYLWNLFEKIPV\EPHGDIPKYVPVFQSAKPRL\DCL\IEVYRSCQEILAHQKATSTSP
918	8969	A	186	49	1357	RTPERCLREVGKATGWPECILT*QTIIPRP/YPSVGTAASDTKKKKINNGTNPETTTSGGCHSPEDAQVQTIRILTCQKTELQMALYYSQHAVKQLEGEARDLISRLHDSWKFAGELEQALSAVATQKKKADRYIEELTKERDALSLELYRNTITDEELKEKNAKLQEKLQLVESEKSEIQLNVKELKRKLERAKLLLPQQQLQAEADHLGKELQSVSAKLQAQVEENELWNRLNQQQEEKMWRQEEKIQEREEKIQEQEEKIREQEEKMRRQEEMMWEKEEKMRRQEEMMWEKEEKIRELEEKMHEQEKIREQEEKRQEEEKIREQEKRQEQEAKMWRQEEKIREQEEKIREQEKKMWRQEEKIHEQEKIREEEKRQEQEEMWRQEEKIREQEEIWRQKEKMHVRTDEISVCSIFQGFISVGFLCKFAYPFDCFTL
919	8970	A	1861	'20	465	VACCVRIPGPPRRSGPAMAVTITLKTLQQQTFKIRMEPDETVKVLKEKIEAEKGRDAFQNMRQVIQQNPALLPALLQQLGQENPQLLQQISRHQEQFIQMLNEPPGELADISDVEGEVGAIGKEAPQMNYIQVTPQEKEAI*RLKALG
920	8971	A	1862	6	448	
921	8972	A	1863	391	1610	VAMCVEIPGPAASLGPRHWPVTITLKTLQQQTFKIRMEPDETVKVLKEKIEAEKGRDAFP\VAGQKLIYAGKILSDDVPI\RDLFAFDGGRNFVVRSWVTK\TKAGQGYLQAPPGGPSPHSLPQSPLTSFPPCPHLQACSIPPLAGQRRHKSPSEE\SGPKTFPESV\SGSVPSSG/SGSGREEDA\ASTL\VNGAFEY*GRWLTEIMSMG\YERERVVAALRASYNNP\HRA\VEYLLTGIPGSPEPEHGSVQESQVSEQPATEAAGENPL\EFL\RDQP\QFQ\NMR\QVIQEEPLRCCPALLPASWAQENP\QLLTAKSARPPRSQFI\QMLERSPPGEAWADI\SDVEGEVGA\IGEEAPQ\MNYIHGDARRRKEAIER*KALGFPES\LVIQPYF\ACEKNED\LAANFSLSQNFDDE
922	8973	A	187	1	408	ASDRPESRATHASGKSPVFSDEDSDLDFDISKLEQQSKVQNTGHGKPREKSIIDEKFFQLSEMEAYLENREKEEERKDDNDDESVKSSRNVNNKDFFDPVESDEDIASDHDDELGSN/EDDEIAEEEAEEGSISEI
923	8974	C	1870	293	448	MXKTLQELRAHENEITXVRKVTFNGLNQMIVIGLPPSLTELHLGWQQNQQS*
924	8975	A	1871	1	475	SYIRIADTNITSIPQGLPPS/LTELHLDGNKISRVDAASLKGLNNLAKLGLSFNSISAVDNGSLANTPHLRELHLDNNKLTRVPGGLAEHKYIQVVYLHNNNISVVGSSDFCPPGHNTKKASYSGVS/LFKNPQYWEIQPSTFRCVYYVRSAIQLGNYKKK
925	8976	A	1872	1	636	

926	8977	A	1873	196	1274	IMKATIILLLLAQVSW\AGPFQQRGLFDFMLEDEASG\IGPEVPDDRDF\EPSLGPS/VCPFRC\QCHL\RVV\QCFLILGL\DKVTKGIFSPLNTTLLDLQNNKITEIKDGDFKNLKNLHALILVNNKI\SKVSPG\AFTPLVKV/EERLYLSKESA*RELPEKMPKTLQELRALED*/EFTKVRKVTFNGLNQMIVIELGTNPLKSSGIENGAFQGMKKLSYIRIADTNITSIPQGLPPSLTELHLDGNKISRVDAASLKGLNNLAKLGLSFNSISAVDNGSLANTPHLRELHLDNNKLTRVVYLHNNNISV\VGSSDFCPP\GHTPKRASYSGVSLFSNPVP/QYWE\IQHPTF\RCVYYVRSAIQLGNYK
927	8978	A	1874	248	1393	IMKATIILLLLAQVSWAGPFQQRGLFDFML*DEASGIGPEVPDDRDFEPSLGPMCPFPLQCHL\RVGQGSDLCLEQMPK\DLPPDT\TLL\DLQNNKIT\EIKDGDFKNLKNLHALI\LVNNKISKVSPGAFTPLVK\LERLYLSKNQLK\ELPEKMPKTLQE\LGAHEEWDHQKWRKS*LFNG\LNPMIVHRNWAPIPLKSS\GIENGAF\QGM\KKLSYIGI\AD\TNITSIPQGL\PPSHTKLHL\DGKQKSSRV\DA\ASLKGL\NNL\AKLGIEFSNSISAG*TNGLSGPTRPH\LRELHLGQQQALPRVPWWGWAEH*VHPRLS*PFITNQYLCRLGSSDF\CPPG\HNT\KKASYSG\VSLFSNPVQYWEIQPSTFRCVYYVRSAIQLG\NYK
928	8979	A	1875	81	137	TMAFPAGFGWAAATAAYQVEGGWDADGKGPCVWDTFTHQGGERVFKNQTGDVACGSYTLWEEDLKCIKQLGLTHYRFSLSWSRLLPDGTTGFINQKGIDYYNKIIDDLLKNGVTPIVTLYHFDLPQTLEDQGGWLSEAIIESFDKYA\QFCFSTFGDRVKQWITINEANVLSVMSYDLGMFPHARSHFGTGGYQAAHNLIKAHARSWHSYDSLFRKRQKGMVSLSLFPARLEPADPNSVSDQEAAKRAITFHLDLFAKPIFIDGDYPEVVKSQIASMSQKQGYPSSRLPEFTEEEKKMIKGTADFFAVQYYTTRLIKYQENKKGELGTLQDAEIEFFPDPSWKNVDWIYVVPWGVCKLLKYIKDTYNNPVIYITEDGFPQE*PSAFWMDTSTLGSIFRQTFQELFKAIQLDKVNLQVYCAWSLLDNFEWNQGYSSRFGLFHVDFEDPARPRVPYTSAK*YAKIIRNNGP*RTRGAWLLWPKGALLLAAEDPSRQLLKPWLSLQDLDGRQPLQLIK
929	8980	A	1876	243	1126	FQQRLYRAARRFTMVKIAFNTPTAVQKEEARQDV\EALLSRTVRTQILTG\KELRVCHPGKKEGSSGEMLWFTLFRAFQFILG\GLYLFGGACIYK/YTFMPKRHHFTVGEMCFFDSEDPANFPFGGGEP*LSCLVT*/EEADIREDDNIAIIDVPVPSFS\DSDPAANYFMTFEKGMTA\YL\DLLLG\NC\YLMPLQYFYLLWPPKKIWVELFGQTGRVGRY\LP\QTYVVR\EDLVAVSRKIRDVSNLGIFIYQLCN\NRKSFRLRRRDLLLGFNKRAIDKCWKIRHFPN\EFIVETKICQE
930	8981	A	1877	985	1401	DFA*V*RDRVKFKGTCFLFV*WFLKFFFKMEFLLPRLECNGKI\HCNLLLMGSSNSPTSASQVAGDYRHVLIWWFLIEMEGFPMLVRAGLKLLYLEWIGSAF
931	8982	A	1878	184	481	SPRCNPSPLPQAFQGSGDCPLPCTAAGLMCAWRSAREPCLLPHPCLPRVWHRRDP/CSQPTSQG*TEALPILCK*KPPPWPPQEISPSQWIHQSPADPAL
932	8983	B	1879	148	194	XNILSVIAVRKLFTAAX*

933	8984	B	188	1	1995	MSKETRQSKLAEAKEQLTDHHPQTNPSVGTAASDTKKKKINNGTNPETTTSGGCHSPEDEQKASHQHQEALRRELEAQVHTIRILTCQKTELQMALYYSQHAVKQLEGEARDLISRLHDSWKFAGELEQALSAVATQKKKADRYIEELTKERDALSLELYRNTITDEELKEKNAKLQEKLQLVESEKSEIQLNVKELKRKLERAKLLLPQQQLQAEADHLGKELQSVSAKLQAQVEENELWNRLNQQQEEKMWRQEEKIQEWEEKIQEQEEKIREQEEKIREQEEKMRRQEEMMWEKEEKMRRQEEMMWEKEEKMRRLEEMMWEKEEKIRELEEKMHEQEKIREQEEKRQEEEKIREQEKRQEQEAKMWRQEEKIREQEEKIREQEKKMWRQEEKIHEQEKIREEEKRQEQEEMWRQEEKIREQEEIWRQKEKMHEQEKIRKQEEKVWRQEEKMHDQEEKIREQEEKMWRQEEKIREQEEKIREQEEKIREQEEKIREQEEMMQEQEEKMGEQEEKMQEQEKMRRQEEKIREQEEKIREQKEKIREQEEKIWEQEEKIREQEEMMQEQEEKMWEQEEKMCSRKRRCKNRRRKYVFARIIQRVYLLNHIIRNRKSVQILVLSCSDFLNSKNSHLLPDTLMLEDKAYLQIESCLIPNEEEYQYLAE*
934	8985	A	1880	2	1508	PESVGGGKTLQQEEKQLQPCMQMDNRLPPKKVPGFCSFRYGLSFLVHCCNVIITAQRACLNLTMVVMVNS\TDPHGLPNTSTKKL\LDNIK\NPMYNWSPDI\QGIILSS\TSYGVIIIQVP/VLGYFSGIYSTKKMIGFALCLSSVLSLLIPPAAGIGVAWVVVCRAVQGAAQGIVATAQFEIYVKWAPPLERGRLTSMSTSGFLLGPFIVLLVTGVICESLGWPMVFYIFGACGCAVCLLWFVLFYDDPKDHPCISISEKEYITSSLVQQVSSSRQSLPIKAILKSLPVWAISIGSFTFFWSHNIMTLYTPMFINSMLHVNIKENGFLSSLPYLFAWDL/CGNLAGQLSDFFLTRNILSVIAVRKLFTAAGFLLPAIFGVCLPYLSSTFYSIVIFLILAGATGSFCLGG\VFINGLGYCSPDILGFIKACSTL\TGN**GGLIAS\TLTGLIL\KQ\DPESAWF*NLQSLMASPLMVTGP*FSHPYRLPTARNSRDW\AKEKQHHTSPEV
935	8986	A	1881	90	458	HFSRGYLEAFSEISNIRFVPPHSVTVVVVFGACFLCILGIWPWACLPGPGGEGSGGFGEGRGSEAGRLGSVELTP\ATLPLQAPEAYPVFEPVPPVPEAAQGDTEDSEGAPPLKRICPNAPDP
936	8987	A	1882	15	796	PGSTISWRPGLARSLSPPDGRRPRRGLGPGPSPASMAGRTVRAETRSRAKDDIKKVMATIEKVRKWKKRWVTVAATPFRILNWVA\VVDPQEEER/RREAGGGAERSRG\RERRGRGASPRGGGP\LILLDL\NDENSNQNFHSEG\SLQRGTE\PSPGGTPK\PNRPCVTLPDPPEGGP*EGLSPPR\LGQEERSPGGITV\GSTYEPP\MLTKEEPVPELLEAEAPEA\YPVFETVPPVHETAQGDTEDSEGAPP\LKRICPNAPDP
937	8988	A	1883	566	831	ARSFFLITILIQRTDWRKNKFFPSNFPSNLRTNFLDQFLLKETILRKH/RVGLGVLAHTCNPSTLGGRGGWSP*GQEFENSLTNMVNHFS
938	8989	A	1884	534	1835	GSSYMHFQGEWVIAQCFKKLHRGVCVCVCL/CLYTHICIF*YITKAILMNY/ACI*KNSCHLAHRFVCMCIYICMYVWCGYIVLKITQ*CMY
939	8990	A	1885	60	395	
940	8991	A	1886	1	193	FRLARGENLEHLRNKTEDLEATSEHFKTTSQKVARKFWWKNAKMIVL/VFIIILFIVLFATGAFS

941	8992	A	1887	1	280	
942	8993	A	1888	1	396	
943	8994	A	1889	85	410	DMEEASEGGGNDRVRNLQSEVEGVKNI MTQNVERILA\RGENLEHLRNKT\EDLEK PTS\EHFKT\TSQKGGSEKFWWK\NVKDD CPLICRDCF*SSSLLQLWLFA\TGAFS
944	8995	A	189	386	1321	RTLERCLTEVGKATGWPQCILTYARRSL APVLLGSH/HGRGLQTPGKLWSWGKSEE QECEEDGSETETGGQEDLEDLQEEEEVS DMGGDNPEVGKKARNSSKFELRKSPVF\ SDEDSDLDFDISKLEQQSKVQNKGQGKP REKSIVDDKFFKLSEMDLYLENIHK\R*E ERKDDNDDELRDSPPQTSPSVGTGATDT KKKKINNGTNPETTTSGGCHSPEDAQVH TIRILTCQKTELQTALYYSQHAARQLEGE SRDLVSCLHDSWKFAGELERALSAVTTQ KKKADRRQTGAESAAVGELGDTGDTVG SEHWT
945	8996	A	1890	122	975	AARPTRHLCCGQQGQVLVCGPSAVGRL PLQWGLGLGPTMSSLGGGSQDAGGSSSS STNGSGGSGSSGPKAGAADKSAVVAAA APASVADDTPPP\GVGTRAVSSVSPSTRA CA/GSRPLSHYSSFGSSGGSGGGSMMGG ESA*QGHCGCSRGLPVGQWA*PGGGHG GGQKQPYLKAQKWCCGQPAEQGRAGH GAGSRGTADAAAVFAVHRDAEARGAG ASPADERGGLLACLDMEAVAGAEALNG QSDFPYLGRFPHSTQGLLSLLTPAGVVS WAEKRAAHGRAWA
946	8997	B	1891	1	8736	MPGQILVKAAQLFQQKAKSFHRMVLEQ LGIYWETNKPGPFHPITHENEFEMNHRG ECKTKNYKTSRRKYRRTSLTPRGQQSFL RIQKIGQRYLQYIYQAKASNPECTKNSC KPKDKQPDRNMGKKTLESDKEGLRPKA PIPAPDPVAGRTLIGKEHVPILWGGVLAS GTSCSLSPAGSPVHPTTLRDHQLGPPQPL WSCLELQPHQTHNKFVGRGGAKERDRN LARACPPLSQGQWQRPGLNTTINIPAGE NLNL
947	8998	C	1892	377	463	
948	8999	A	1893	753	3000	KLEPCGGTPGPRAGSGPCQDPHIPPEGVG GSPDGPGAWPAPNTHSASWSWGPHPEC PPPA*AADCRGTDRSES\PASPVCPLSPNS QRPPHLEAPGYLPGGSSRTQPAV/PTCSP PGIP/AVPALCP*PG*KTT/PIYTEAGKLAT SAPGT/PPRQLSPGNAVYCLPPDTHTQPG RAGLAESAPYPEAQPAGVGQEGDAGTE/ PGPSCQTQH*PPQEPLLGPPPQL/PPTSQQ PEGGALHSWPQRWPRKPFPDP/PL/PVRP VWSAKPWNT*RRSPPGAPSPTRTAMGT\ TTPCPRPSPDSKHVPLALPGAP/VPAQILD LLPRQALRTEPSAPEPLAGYGDSPWLCG MAVSTGPVLPWLRNGPRTNHSC/CRSRN FASALHGAA\PSKSFIRR*WGRTP*PAGC PF/PGLGIVPRSTSSAPTQLGSGNVAVVG HVRVLPSFHSDGFLQPMSSSGSLAQQSV WASLGSEQQQVPMLPPASPGTPAARAGP VQFEQCLLQSPTWKPYP/PARAFQAVP*S RMVCPEAGPRSQQ/PA*QPPGLPPPPPAT RVG/PPDVKGRGRLGSPGRPA/PPACMSP EQLPIGPLLAWGLQDARPAGAGGRAFE* PPGGSSQRFPPSGT*EAE**QF/VNGDGPA PTFSCPMGKPASPCPVRAVPPALPDVLTL GNTAALGGSLKAFGNLQPSLDNS\PVP*\ LLEGPTEPQPPRTTSAPKECSSSPTMPGV GPWVTGTSGRPTFLSPFFSYEEHFKVLLF KEITVQQAAEDGFHHRPFPRNKQ

949	9000	A	1894	3	576	LTRIPFLGAKYAPVIFA/EGA/YQ*QRS*TEIQMACFKQATRWVKC/DPRHGKYMA\CCLLYRGD\VFPKDVNAAIATIKTKRSIQFVDWCPTGFKV\GINYSPPTVVPGGDLAKVQRAVCMLSNTTAIAEAWARLDHKFDLMYAKRAFVHWYVGEGMEEGEFSEAREDMAALEKDYEEVGVDSVEGEGEEEGEEY
950	9001	A	1895	58	1636	LVGDGNPGPGVCSCRLRLLIPYPLCGECI\SI\HVGQAGVQIGNAC\WELSCL*HGIQPDGQMPK*PKPLGEGDDSFNTFFSETGAGKH\VPRAVFVDLEPTVIDEVRTG\TYRQLFHPEQVITGKEDAANNYARGN\YTIGKEIIDLVLDRI\RKL\ADQCTGLQG\F\LVFHSFGGGTG\SGFTSLLDE\RLSVDYWQESPSLEFSIYPGAPRFPQPVVEP\YNSILTTHT\TL\EHSGLCPSWVENEAIYDICRRNLDIERPTYTNLNRLI\SQIVSSITASL\RFDGALNVDLTEFQTNLVPLPRHSTSLRPTYAPVNPPS*EKPTH\EQAFCSRRSPKCFAFEPSQPRWLKCDPSPMGKY\MAC\CLLYR\GDVVPK\DV\NAAIAHPSKPKRS\IQFVDWCP\TGFK\VAINYQPP\TVVPVGDLA\KVQKTV\CMLSNT\TAIAEAWARLDHKFDLM\YAKRA\FVHWYLG\EGMEEGEFSKA\REDMAAL\RKDYEEVG\VDSVKG\EGEEEGKGILIIHSLFGPCSMSCSQNFSFSLTDRR
951	9002	A	1897	2	350	SQVDR*QSEPESIRICREDHMERLQAFDANSRKQEAEWKEKAIKELEEWYARQDEQLQKTKANNRVA\EKLSTNNPSLT*LVMSEEAFVNDIDESSPGTEWERVARLCDFNPKSLD
952	9003	A	1898	2240	2492	
953	9004	A	1899	1	906	ATAVVSVGRLVFVSTGCVRAVQLPAMAELDP\FGAP\AGAPGGPALGNGVAGAGEEDPAAAFLAQQESEIAGIENDEA\FAILDGGAPGPQPHGEPPGGPDAVDGVMNGEYY\QESNGPTDSYAAISQVDRLQSEPESIRKWREEQMERLE\SLDANSPESKKQSWKEK\AIKGA*KEW\YARQDE\QLQ\KTKANNRVADESFLQTTLR*RDWLCHKHKPSLLQPRTGQPEEALFK\DLEGLSPSNEWE\RVARLCGL*PPSLSKQA\KDVSPHGASVLI\SLKAGPRWGHLKSHPVETLHLQYLNPTQ
954	9005	A	19	12	288	FGGGYIPTWGKGEGILALELNHDISREFCSAPALASRPPPTPPPLLPPT/PPLPAPRSPADATPRRVGGPLR*ALKPRAPGPGWSRRRCRSWW
955	9006	A	190	792	1061	GSGV*DQPGQHGKTPSLLKIQKLAERGGGHL*SQLLRRLRQENHLNPGGRCC\SEPRLLHCTPAW/VNESKTSSQTNKKISQEWWCVPIVL
956	9007	A	1900	29	852	PSRSLVRVVEFAPQRWLPGVVSVGRLVFVSPVGVRAVQLPAMAELDPFGAPAGAPGGPALGNGVAGAGEENPAAAFLAQQESEIAGIEN\DRAFAIL\DGGAPGPQPHGEPAGGPDAVDGVMNGEYYQESNGPTDS\YAAISQVDRLQ\SQPES\IRKWREEQMERFGKPFDANSRKQEAEWKEKAIKELEEWYAR\QDEQLPENQKANNR/AQTEARPL*NDID\ESSPRPLKWGNGWPRAV*TLNPPKS*AKQAQKMSPPHDASVLILPLKAGPRWCH
957	9008	A	1901	1	585	

958	9009	A	1902	2	537	GTLRRDFNHIN\VELSLLVKKKKRLRVDTMLGQQKRNWPTRSGLFGSHVQDHDQGVLPLGFPLPRMRVLCMPHFPQSTVVIPGRMGSSLLKI\RNFLGVKNTI\RRVR\MRPGCCLVQYPQAQKDELILEGN\DIEL\VSNSAG\LIQQATTV*KQGISGNFLDGIYVSEKGTCSCRLMNKI
959	9010	A	1903	560	898	KCNTECFGSLMHFVVVLFIIIIIFLRQQGRSVT\RLECSGAILAHCNLRLPGLSNSPASASRVAGTTGTCYRIQLIFVFLVETGFHYVGQAGHKLLT*VIHPPQPPKVLGLQV
960	9011	C	1904	224	379	
961	9012	A	1905	1249	1642	LGCYPGPFIHPVKWMIFPDPCEISVTGVCVC/G/GVCSCGVCG/CG/CGCLPGGKGICKYI*ICSQIL
962	9013	A	1906	415	656	SLPRSPLGRGTPSPQHLSSNLNLASLYHPHEITPWIIFSSSGSSI*TPI/TPSFYPSPTNCDPQIFDPQTPVSGCRLASSQGPSLSNPTSNLSGPQIPFASYPCLLLAPHPSLPASRPQSCPSPKTWAPPS
963	9014	A	1907	1	417	TISWNTGPRARSRARGSSTGLDGCVGGGSGGNSGLPCPDLEPLGGLQSKCRLCAPTEARGLWS/KVPLFRQVRHLALHACGCREAWPPPGPPPLLVALCFHLKALPSRGSRAGREAVSKHLKFAMLAGGRVCGSRRVLSM
964	9015	A	1908	1	438	QCTPSSAADCPELTACYGFSS*PS*GPSPLPWRPRMCESWVLHLPPTPQCFSWDIGPSEVMVRPLGWDTLRGSMLPW*GAGERAGKPLPAPADASPHRSGTGFDRAAGGRGRRRCNRSEEGVIPFAAPRLLPPHAFWRVFPHWETT
965	9016	A	1909	113	704	
966	9017	A	191	2	343	LLFFFFFEMESCSVTRLECSGVISAHCKLC/LPGFKRFSCLSLPSSWDYRRM/PPRLANFLYF\VEMGFHRVAQAGLKLLSSGNLPASA/F/PKY*NYRRDDASLAACSTFLGLGLLWV
967	9018	A	1910	317	470	NYPMSVVP\QD\MWRKSHAA/HILREMSSK\TAAQL*WNNAYFGSSKGLSCVWP
968	9019	A	1911	147	850	MAASGAGAEVSGR*GREPPPALPPAP\CGP\RRRRSPP*LPKTYRFFSLWQRGRPDRSSAPI\GNSGLPCPDLEPLGRAARSKCRLCAP\TEATKACWK*GPSCFRQV\RH\LALHACGCR/EG/LGLPQGPPTSAGLLCAFTLKALPSRGSPCKEEKLSASTSNFSHAGCGRVCGSRRVLSML*FSGLKLP\LSVVPQDM*RK\SHAAHLR\EMSSKACRSAFDGNNALFLEVSKGLSCVWP
969	9020	A	1912	119	1001	GSRTKGRAVPECACAPVGAGEGRPAGVAVSDGVIKVFNDMKVRKSST\PEEVKKRKKAVLFLP*VRTKNNIIL\EEGKEILVG\DVGQT\VDDPYATF/VSKMLPDKDCRY\ALY\DATY\ETKE\SKKEDL\VFIFLGPPESAPPLEQNGFMPSSQGRPSKKGSWTGDSSHEFAKPNCLPKEGQGTACTLAREAGGQVPVYSPGRAKPFVSPFWPPCLGASGSPQHLAPWGFAGCPPFLQRPGRAWGGSPAGGGEIPLNPSCPKQTPPNPPGNFPSPSNPLDGFWPFPKLLFESFDSSWG

970	9021	A	1913	361	1785	LPLPRWKVLLPRDILGPRKINEVSSSDDK DAFLCEQTSGDILKKTSEVVKSSPLGVTP LFMQSNVINSTAIVKTLAATGTGFDCAS KTDIQLCAESRGVPPERIIYGKSFVKQVS QIKYAANNGVQM\MTF\DSEVELMKV\A RGTFPKAKVWVLRIA\TDDSKAVCRLSV KFGATLRTSRLLLERAKELNIDVVGVSF HVRSGCTDPETFVQAISDARCVFDMGAE VGFSMYLLDIGGGFPGSE\DVK\LKFEEIT RP*STQPLDKYFP\SNSWN*KS*LEPG\RY YVASTFDALQLISFAKKICIKRNQTGS**P KIESELSRPLMY\YVN\DGVYGSFNCILY DHAHVKPLLQK\RPKPR*RRYYSSSIWGP TCDGLDRIVERCDL\PE\MHVGDW\MLFE NMG\AYTV\AAASNVPMLPRGPTIYYVM SG\PAWQ\LIQQFQNP\GFPPGSRRQPGCP APCPVFCAW\ESGMKRTRASPVPSG
971	9022	A	1914	501	746	ARSSLVLLFIYIFRDRVLLCHSGWSAVVQ SWFTAALISQA*VILK*FSHLSLPSSWDY RQVSPHPANF/SYILFCRDR/SFTMLPRVG WNSWAQVLLLIQPPKVLQL*AGCHGSCL
972	9023	A	1915	156	166	VLFLKRPYLVQDAVLWLFT\AIISHSTLEL LGSSYPTTSAS*VKHSNSNIMKFKVPVLN ECTMQLGTKTMIIKVLVKSYF
973	9024	A	1916	452	1017	SLHGISRPHLPTGRLLGPETCAGFSRFGQ NESLTPFVTSDR\SKNR\KRHFKAPFPHFE GKIMSSPLSKE\LRQDVQLCGSDARS*KD \DEVQVV\RGHL*GSAKLAKVVQ\VYRK KYVIYIER\VQREKA\NGTTV\HVGHFTPS KQVVIT*G*NWDQRPAKRSLRTGKPKSR \QVGKGKRGKYKERT\IEKMQE
974	9025	A	1917	3	474	
975	9026	A	1918	1	246	
976	9027	A	1919	373	560	SQLKNAKFNLSRPLPPNVY*DKGQYVTS QLYQNAAQPIFKQAFAETCAHHTNTIQD QAPRRI
977	9028	A	192	2	447	KEEIIPIL*NLFQNIKAEGILRISFNEARITL I/PKPN/RAITRKINPIDQSLMDRHAEILNK ISAN*IR*RMKRIIPHGQVRFS*GMWGWF NIRKQINVIHHTHSLKKKNHMIISINAEKE FDKIRKLLKLRNIYKRGI*LT**VMVRNS
978	9029	A	1920	837	1441	IFFFHLSPSHSHARSHFLFAIMNRPAPVEI SYE\DMRFLITHNPTNATLNKFTEGT*GS MGVTDFGFGVCGWLHMDK\APVWKKE GFHVL\DW\PF\DDGSSTPLIQIVGWIGFK PV*KTKFSCKSHGCCV\AVHCVGRVGEG APVL/VLALALDWNVGMK\YEDAVQFIR QKRRGAFNSKQLLYLEKYRPKMRLRFR DTNGHCCVQ
979	9030	A	1921	2	1059	GRVGFFFAGNPGSDSFGGLLLGLTPVLR WVADGGTIPKRHE\LVKGPKKVEKVDK\ ETELVAQWNYCTLS\QEILRRPIVACELG RLYNK\EPVIEFLLDKSAEKALGKGSISH* NALTNC*QS*KLSDNPCPGKGIKGNTKG DK\HDDLQAGASFI/CP/LVGGPGRWNGR HRFLLPSGGCGLCCFS*AEPWKEIKAEFC HTCGAGLSRRMMIIVLNGTKEDVDVLKT RME/AEKAVERSFKRISKKPKAAESVSKT QMSVEGSPRAHQKLRPGKP*RSPALDSR EKKTNLAPKSTAMNESSSGKAGKASVW SHKEVHR*PVKNRKPNKSLFTTHSFRQS APKEGVCPTGVHPTRPTCF
980	9031	A	1922	272	467	
981	9032	B	1923	131	268	XFVTCPNEKVAKEIARAVVEKRLAACV NLIPQITSIYEWKGKIEEDX*

982	9033	A	1924	2	353	GSPPT\QPSPASDSGSGYVPGSVSAAFVT CPNEKVAKEIARAVVEKRLAACVNLIPQI TSIYEWKGKIEEDSEVLM\SVHPYEVAEV IALPVEHGNFPYLQWVRQVTESVSDSIT VLP
983	9034	A	1925	70	357	
984	9035	B	1926	120	839	MSGGRAPAVLLGGVVSDRPRPAPSGPRS LDRYPHPKSQRRFAKEIARAVVEKRLAA CVNLIPQITSIYEWKGKIEEDSEVLMMIK TQSSLVPALTDFVRSVHPYEVAE*
985	9036	A	1927	259	935	GASLLLSFVWMPALLPVGLPAFLFANPE SLLTMG/SLGSPSDPSPRPASDSGSG\YVP GSVSA\AFVT\CPNEKGSPREIAR\AVGGR RRLA\ACVQPSSPQITIPSMKWK\GKDSR EDS*GCWMDGFKTQKFPWVPSFWTDFV \RSVAPYEV\AEVI\ALPVEQG\NFPYLQW VRQVTESVSDSITILAMMSPVPAHHEDP RDTSKAFLTFQVMTWAPNKSRLWVKKK KKSR
986	9037	A	1928	285	476	LLKHLINNMMVSKTTWLGVLAHTCNPS/ TNFLGGRGGRIS*GQEFEASLGNMGRPC LYKNRQKTN
987	9038	A	1929	218	602	NGGQAVAHACNPSTLGGQWRVDHLRS GVRDQPGQRGETPSLLKIQKLAGRGGAR LWSQLLRRLRQENRLNLGGGGCSEPRW H\HCIPAWGNKKE*NGNYAQRMGERWL TGLKHQRNGEDRTVRELSGR
988	9039	A	193	128	363	VHTWMLSSP*GPQPGVFHAQIRGCPFLSP *R\CQFQVFSLFYFDLLWVFTILFFFLEAE YHFVARLECSGLISAHCNLC
989	9040	A	1933	2	355	TSMLGCTVLFLR/YCVYS\YCNVLATVW SSLV*RSLRICLHLVS/WSFVTDCKACYN TGMLFYSDY**FVYYF*YYCFFLCSLFFSI CLLMYFNIFFF/CNFMFDCYILLLSFYFIIL YHYF
990	9041	A	1936	139	782	GLHHGCSLGMEEAAGRGDRSRSRCRAP QHHRPPPPLSCQQPRLLGEAGRGGVRGK HGSL*KQAPPPRGRAETPGLANHTLPPR VPP/SEGQQHPREGQGLHGGPGEKGKPH RRKLKASVPCVSAERVNGPKGSSLQTAR IHPTGGHRKPTGAVCVCACAAHTSAAR GPLRPHHTACPAHVCTRRCRREHTPPSL CTRVPLSGPGGSSLLHVVLSRA
991	9042	A	1937	1	1878	
992	9043	A	1938	345	557	LYMLIRMRLKEGRAKMVESIFR**FILE* SVLS/RIMKPGMYPVLNRWVKCGNSSSV SYPEEKVVGWLLKFI
993	9044	A	1939	345	511	ARDATFVNGLDYLITLPYCGWKDCKKK CPLRQFP*PFNCCFFLVVFVRV*KHSLP
994	9045	A	194	233	598	
995	9046	A	1940	827	2660	
996	9047	A	1941	478	1150	SMPWQIGRSSVSAPPTITPTSSTASWTIVS STIWSPHVPATTKVSTLHWTVVRRLLVII SKIIVISTSIISSSIVVITTSVAPTLVAISRSS TTISSSSSSITGATSKIATSRSSSSAGSRAE VLLAELFLEQRQFSLQRQDESGSCSSAEI SLISLGCGKSG*SD*VRDGERKRNSSVSS LLVA*ALKPQKKV*GTTTNNGESLQTVW **GILQAKDQEDLVL
997	9048	A	1942	123	734	LFKSAIKNGLQHELHCRKWEKKQNG\KS KKVQ\EAE\PVESGVEKVLDRRV\VNGKV E\YFLKWKGFTDADNTWEPE\ENL\DCPE LD*SRFLNFSRKAGQRKRWVPKRKSLSD \SESDDSQIHRRKRDAADQPKEDFARG\L DP*KK*LGAHRPASGE\LMFL\MKWKDS\ DEADLVL\AKEANMKCP\QIVIAFYEEKP TW\HSCP\EDEAQ

998	9049	A	1943	1092	1285	IDVCVCLALLLRLECSSVISAHCSLCS/SGSSDPPTSAS*VAGTTTACHHAQLIFGFFFFLKRWGF
999	9050	A	1944	76	532	LPRPRSRLTALPPPPSFLQTPKSRALMAGLEVLFASAAPAITCRQDALVCFLHWEVVTHGYCGLGVGDQPGPNDKKSELLPAGWNNNKDLYVLRYEYKDGSRKLLVKAITVESSMILNV\RTYKNSEELRSRIVSGIITPIHEQWEKANVSSP
1000	9051	A	1945	109	1008	ALPPPPSFLHTPKSRALMAGLEVLFASAAPAITCRQDALVCFL\HWEVVTHGYFGLGVGDQPG\PNDKKSELLPAGW\NNNKDLYVLRYEY*GWGPESFLVESHSPWESSIDSSMLLGIMGSQQSWQI*PLNLG*LFSMAEHLGDFHRTYKNSEELRSRIGA\GIL\TPIHEQWEKANVSSPHREFPPATAREVDPLRIPPHHPHTSRQPP\WCDPLGPFVVGGEDLDPFGPRRVG\MNV\DPLRSGLP\RAFNDP\SSGLPNRL\PPG\AVPQGAGFDPFGPIG\TSPPG\PNP\DHLPPPG\YDDMYL
1001	9052	A	1946	152	991	RKTKCVTRPAVVFQSPLTSRSSRASACEVAFPRGQPRKGPKRDNWILGTRPSWVAVCSSPRLGLSR\EYKLVMLGAGGVGKSAMTMQFISHRFPEDHDPTIEDAYKIRIRIDDEPANL\DILDTAGQAEFTAMR\DQYMRAGEGFIIC*LLSRIRRSF\HEVPESLNQLIY\RVRRT\DDTPVVL/VWGNKSDLQTA*DRFTKGRKGLALAPENSSCPLFWRTSGCHTR\YYIDGCFPHAP\VREI\RRKEKEAV\LA\MEKKS*APKTSVWKEAKNHPFRKKKDSVT
1002	9053	A	1947	305	406	
1003	9054	A	1948	372	501	RPGAVAHSCNS\STLGGRGRWIT*GLEFETCLANMVKLCLFHLY
1004	9055	A	1949	441	812	ITTHLYISKPLLCTPMKTYNYYLSIAKIKF*FSLLRQGLALSPRLECTSTITAHCSLNLPGFKQSSHSQPSE*LGTTDTHHHIQLVFLIL/AETEFCHVAQGGL/NIS*VQLIHLPQTSKVLGLQM
1005	9056	A	195	38	1222	EPESCSVTRLECSGVISAHCNFR/LPGFKNFPASASQVHGTTGTPHHAQLI\LYF*VEEQGFPPMLAPGWILGSP*PLMDPAPSLALPQSAGDPQP*AHPHPGPSYLFLFKERENYERPKII*LNPLPLAQGKKMEFALI\WVMKHTQ*IRNNHIFSKRQK/C*DL*SYMVAYFWVGKK*EKNITSLTGNDTF**KILLSFPTRMIHCKAKIIY/IAKFFFWRRSLTSVTLGWSAVWHNLSSLQPPPSGLKRLSHLNLPNT/WDYRPPCPANLCFVVVVVVVLLFVFW*RWGF\TMLARLISNS*PQ/CDPPTSASQSAEITGMS/HPCLAMGFVFHLTL*KPPFFKDYMKSFFQFFKYLIQG*CSLV*GVRYRSSLIFFF/CFFETESCLVTQAGVQWRDLGSLQS
1006	9057	A	1950	2	370	
1007	9058	B	1951	209	524	MLLSLAAFSVISVVSYLILALLSVTISFRIYKSVIQAVQKSEEGHPFKAYLDVDITLSSEAFHNYMNAAMVHINRALKLIIRLFLVEDLVDSLKLAVFMWLMTYVX*
1008	9059	A	1952	3	463	

1009	9060	A	1953	49	1129	RDLIEFSCRIILFPLPSLPPRISFHPSPTLARVAMAEPSAATQSHSISSSSFGAEPSAPGGGG\SPGSLPRPWGPKSCSSS\CAVHDLIFWRDVKKTGFVFGTTLIMLLSLA\AFSVISV\VSYLILAL\LSVTISFR\IYKFVIQAVQKSEE\GHPFQKPNWNVDITLSSKSFSINNMNAAILHINMFLKLIIRLFLVEDLVDSLKLAVFMWLMTYVGAVFNGITLLILAELFIFSVPIVL*RKYKTQID\HYVGIARDQTKSIVEKIPSKTPLGIAKKKGRIKYMETRNATSYLKHHLISYNVVTCTMKENTQCQLEPAFQAFFLIWCFLPSFPFNPQSSSTKIDGLIKDLFLDLRRRKNQIS
1010	9061	A	1954	46	519	SQTPMGHFTEED\KATI\TSLWGK\VNVE\DAGGET\LGRL\LVVYPMGPQRFL*PALGNLSSASAIHGQPPKSRAHGQEGC*RSLG\DAIKAPGIDLQRAPFAQA*SELALVDKLAMWDSLRNFKASWGKFCLVDPFLAIPFSAKEFHPLRCQVFLGQKDG
1011	9062	A	1955	1	747	
1012	9063	A	1956	1	813	MKEENLCQAFSDALLCKIEDIDNEDWENPQLCSDYVKDIYQYLRQLEVG\LQSINPHFLDGRDINGRM/RAILVDWLVQVHSKFRLLQETLYMCVGIMDRFLQLSLPAEDREALGTSSPQHSGALGDVGYKSGFILSPHPCMSKIEPEDEKLSFLFIGPFLKNPSPRANGDPMFLCLNEDEAQQLEETKWTGCQKQLCDPLSEEVKTGEKLVQTKGERTSRIREVQFLAQNHTTRRWQSWDLGTSSLTPEPVFSLEINVREQRDEDNIQVLRG
1013	9064	A	1957	1	1390	EATASKIPSAAGSESSPNGASYASVPPFSVRVPPWAGLALLPSPSLMALLRRPTVSSDLENIDTGVNSKVKSHVTIRRTVLEEIG\NRVTTRAAQVAKESSGTPKFQVQPTKTTNVNKQL\KPTASCQTQYQMGKVWLPKGPSPTP\EDVS\MKGRESLPKLFSDALL\CKIEDIDNEDWENP\RLCSDYVKDIYQYLRQLEVLQSINPHFLDGRDINGRMR\AILV\DWLVQVHSKFRLLQETLY\MCV\GIMGSDF*QVQPVSRKKLQLVGITALLLAPKYEKMFSPNIEDF\VYITDNAYPS\SQIREMETLILKELKFELGRPLPLHFLRRAS*AGEVDVEQHTLAKY\LMELTLIDYDMVHYHPF*G*PAAAS\CLSQKVLDKGKMEL*SQQYYHKDTQENEVLEVHASTMAQECGAK*MENLNLNSIGHQRIKYAKQQTP*KISMIPQLNSKAVKDL\ASP\LIGRS
1014	9065	A	196	526	835	FNLNFTVSLRTHSPLIPFFSSNERIKPGKSTIDGPWTRRTRL*RKNLWMIQ*LWDFLF/VLFETDSSSVARLECSGAISVHYNFHLPGSSDSPDSRSMPIVDRQ
1015	9066	A	1964	33	513	
1016	9067	A	1965	1	503	GHESDNLLFVQITGKKPNFEVGSSRQLKLSITKKSSPSVKPAVDPAAAKLWTLSANDMEDDSMDLIDSDELLDPEDLKKPDPAS\LRA\ASCGEGKKRKACKNCTCGLAEEL\EKEKSREQMSSQPKSA\CGNCYRGAMPSGCASCPYLGMPAFKPGEKVLLSDSNLHDA

1017	9068	A	1966	29	1270	FPFWPAVFQVCQYCTARMADFGISAGQFVAVVWDKSSPV\EALKGL\VDKLQAF/TPGNEGRVSV\ENIKAAVAILPTKNPSFGHYFVQ/CLVPGKAPLWHSA*DFWAGNPPGFLRPGWMFFFLKEPVETAVR*Q*AKWKTASKL\CSAL\TLSGLV/EKLKELQREPLTPEEVQSVREHLGHESDNLLFVQITGKKPNFEVGSSRQLKLSITKKSSPSVKPAVDPAAAKL\WTLSANDMEDDSMCIFCGCSLTHRWPLEHVVQVE/IMMDQPKRRTRVDT\FFTPRTPKFPSRSPASHFSFSIKQKT/TRPVSLIALNTL\QDLIDSDELLDPEDLKKPDPSLLRAASCGEGKKRKACKNCTCGLAEELEKEKSREQMSSQPKSACGNCYLGDAFRCASCPYLGMPAFKPG\EKVLLSDSNLHDA
1018	9069	A	1967	3	498	LANRAIMSHKQIYYSDKYDDEEFEYRLVLAREQLATGRELWPLRAQGISNRN*GDRIGACVRDMSCCPKDIAKLVPRTH\LMSESEWRNLGVQ/QRSQGWVH\YMIHEP\EPHILLF\RRPLP\RKPKEMKLGKLTFQPSSFYTAGPYLPNIFLDNIIYVGLLVFFTFDI
1019	9070	A	1968	1	690	RRKAFPKRLPKMAEVQVLVL\DGQG\HLLG\RLA\AIVAK\QVLLGRKGGCSYACEGIHI\SGNFLQNQVCSTLAFPLQA/RMNTNP\SQGP\YHFG\APSRIF\WRT\VRGM\LPHKTKAEARPLLD\RLKVFDGIPPPYD\KKKR\MVVP\AALK\VVRFEAYTESFAYLGRL\APEVGWNAIRPVTAPPGGERGKRKAKIH\YRKKK*L\MRL\RKQAREETWRKKIDKYTEVLKTHGLLV
1020	9071	A	1969	2064	2561	KRFWSFALFYYLILKLL/CIDSIVRIGTILYSTVLFFIFLKFKV*LVLITFIQIFAIFFGSETF*QVGV*FLLIPNFFSRVLLILSEGKVI*VCQLIVLLGLNFHIVFTVYGEVVGIYYSILNK/AVIHFFIKV/YFHVKFLFLYVLLLSYITQFLF*KSSFVEVLVKN
1021	9072	C	197	7	276	MQWRDHNYCIFXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXLARPFI*
1022	9073	A	1972	786	1502	PPPTKKEMFVPYSPEQRIETSIPPPFKGTGRP/PGQGRTWERPPFSLEGKAGALPPLLSPRTTKGEDPSETLAQGSGQEGDCLNRWQHLH*SAFRPSSAEPFTRKRLEGGPAPLRYPGAGNEPGRDAEGRP*GALAGRPRWPPSHGRPPPAPCHPASRGGTARKTP/GRSTKPPRFPPPPLGDATSGKAIPANGRKGGAMSPHRGAGPASPSRFFSHIKQGRAIPHVSSRLHFSPSSSGSR
1023	9074	A	1973	8	234	SAQMAVTTADPRVRPRVRTQLCSLASLIQTLLVHLT\PEEKSAVTALWGKVNVDE\VGGKALGRLLVVLPWDPKRSFQSPLGESVPTP*MKVGGKALGRLLVVLPWDPKRSF
1024	9075	A	1974	1	169	NLYISNLPLSMDEQELENMLKPFGQVISTR\ILRDSSGTSRGVGFARMESTEKCEG
1025	9076	A	1975	2	219	
1026	9077	A	1976	17	795	HSTAKLY*HSTFAKRSHRNPQHPYV\P*ISKSLTSSI\NSSTSSNSGWDQLSKTNLYIRGLPPHTTDQDLVKLCQPYGKIVSTNAILHKTTNKCKGYGFVDFDSPVAAQKAVSALKASGVQAQMAKQQEQDPTNLYISNLPLSMDKQELENMLKPFGQVISTRILRDASGTSRGVGFARTESTEKCEAV\MVQSPSWTQPQPYILQHPGAVLTPSMEHTMSLQPASMISPLAQQMSHLSLGSTGTYMPATSAMQGAYLPQY